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Ambient Monitoring for PCB Near Three Landfills in the Bloomington, Indiana Area

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16. ABSTRACT

A monitoring program was conducted to determine PCB levels in ambient air on and in the vicinity of three landfills in the Bloomington, Indiana area. Fixed-height measurements were made at locations on the sites where capacitors containing PCB were exposed (hot spots) and at nominally upwind and downwind locations. Vertical PCB concentration profiles were also obtained at five elevations (2 to 180 cm) above selected hot spots. Sampling was performed over 8-hour daytime periods (approximately 0900-1700 hours) and over 24-hour periods at various on- and off-site locations. Polyurethane foam (PUF) cartridges used either with Du Pont personal-type sampling pumps or EPA-developed high volume samplers were used for collection of PCB from the ambient air. The quantity of PCB (as Aroclor 1242) in the PUF cartridges was determined by extraction and analysis of the extract by electron-capture gas chromatography (EPA Method 608). Meteorological conditions were also measured at the sites during the field monitoring period.

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AMBIENT MONITORING FOR PCB NEAR THREE LANDFILLS IN THE BLOOMINGTON, INDIANA AREA

by

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FOREWORD

Measurement and monitoring research efforts are designed to anticipate potential environmental problems, to support regulatory actions by developing an in-depth understanding of the nature and processes that impact health and the ecology, to provide innovative means of monitoring compliance with regulations, and to evaluate the effectiveness of health and environmental protection efforts through the monitoring of long-term trends. In support of this objective, the Environmental Monitoring Systems Laboratory (EMSL), Research Triangle Park, North Carolina, has the responsibility for: assessment of environmental monitoring technology and systems; implementation of agency-wide quality assurance programs for air pollution measurement systems; and supplying technical support to other groups in the Agency including the Office of Air, Noise and Radiation, the Office of Toxic Substances and the Office of Enforcement.

The U.S. EPA Region V needed to assess the release of PCBs into the air at three landfills in the Bloomington, Indiana area and requested EMSL/RTP to identify the emission points, verify current emission rates of PCB, and to establish a base line prior to any remedial activities. In order to meet these objectives, EMSL/RTP, in conjunction with EPA Region V, designed and implemented a monitoring study at the three landfills to gather data on the background airborne levels and the magnitude and distribution of PCB emissions into the atmosphere in and around the three landfill areas. This document details the monitoring activities and the results obtained from sampling at the landfill during June and July 1983. These data will assist Region V in determining the need for remedial action to reduce the emissions into the environment. A follow up monitoring program will be conducted after remedial action occurs to determine if the PCB emissions have been contained.

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Director
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ABSTRACT

A monitoring program was conducted to determine PCB levels in ambient air on and in the vicinity of three landfills in the Bloomington, Indiana area. Fixed-height measurements were made at locations on the sites where capacitors containing PCB were exposed (hot spots) and at nominally upwind and downwind locations. Vertical PCB concentration profiles were also obtained at five elevations (2 to 180 cm) above selected hot spots. Sampling was performed over 8-hour daytime periods (approximately 0900-1700 hours) and over 24-hour periods at various on- and off-site locations. Polyurethane foam (PUF) cartridges used either with Du Pont personal-type sampling pumps or EPA-developed high volume samplers were used for collection of PCB from the ambient air. The quantity of PCB (as Aroclor 1242) in the PUF cartridges was determined by extraction and analysis of the extract by electron-capture gas chromatography (EPA Method 608). Meteorological conditions were also measured at the sites during the field monitoring period.

Three or four days of monitoring performed at each site during June and July 1983 yielded the following results.

- At Neal's Landfill, airborne PCB concentrations measured 180 cm above five hot spots during 8-hour daytime sampling periods, ranged from 0.4 to 18 µg/scm*. PCB levels observed along the downwind perimeter of the site ranged from 0.2 to 1.8 µg/scm. Upwind PCB concentrations measured during the 4-day monitoring period ranged from <0.05 to 0.1 µg/scm.

- Ambient air PCB concentrations measured at 180 cm above two hot spots on Neal's Dump during 8-hour daytime periods ranged from 0.6 to 19 µg/scm. Over the 3-day monitoring period, PCB levels determined near residences adjacent to the site ranged from <0.04 to 0.2 µg/scm.

- At Lemon Lane Landfill, ambient air PCB levels measured at 180 cm above three hot spots during 8-hour daytime sampling periods ranged from 6 to 193 µg/scm. Over the 4-day monitoring period, upwind airborne PCB concentrations were fairly constant at approximately 0.05 µg/scm and levels measured downwind of the landfill ranged from 0.3 to 0.8 µg/scm.

Generally, the airborne PCB levels measured at hot spots on the landfills appear to be correlated with the quantity of exposed capacitors,

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* 10 µg/scm equals approximately 1 ppb.

i.e., those visible at or above ground level. This is particularly evident at Lemon Lane Landfill where the highest ambient air levels (40-190 µg/scm) were observed above the large bank of exposed capacitors on the site. PCB emission rates and thus airborne levels were probably maximized by the unseasonably warm, dry weather which prevailed throughout the field study period.

Collocated monitoring conducted during the study has demonstrated that the low volume and high volume samplers yield reliable, reproducible measurements of airborne PCB levels. Results obtained with the two types of samplers were shown to be comparable.

This report was submitted in fulfillment of Contract 68-02-3745, Work Assignment No. 4 by Battelle Columbus Laboratories under sponsorship of the U.S. Environmental Protection Agency. This report covers period from August 1982 to July 1984, and work was completed as of October 1983.

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LIST OF ABBREVIATIONS

km -- kilometer
m -- meter
cm -- centimeter
mm -- millimeter
L/min -- liters per minute
scm/min -- standard cubic meters per minute (25 C, 760 mm Hg)
µg -- microgram (10^{-6} grams)
m/s -- meters per second
C -- degrees Centigrade
ppb -- parts per billion by volume
mL -- milliliter

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SECTION 1

INTRODUCTION

Three landfills in the Bloomington, Indiana, area have been used for disposal of capacitors containing polychlorinated biphenyls (PCBs). The landfill sites are identified as: Neal's Landfill, Neal's Dump, and Lemon Lane Landfill. Visual surveys of these sites have indicated several areas where capacitors are visible at or above ground level. In most of these areas, leakage of the capacitors is suspected due to apparent wetting of the soil and damage to the surrounding vegetation. As a consequence of the leakage, PCBs may be emitted, thus creating an air pollution problem.

During June and July 1983, a field program was conducted to monitor PCB levels in the ambient air at selected locations on and surrounding the three landfill areas. Airborne PCB measurements on the sites were performed at localized areas (hot spots) where leaking capacitors were evident. Measurements were made at locations in the vicinity of the sites to determine upwind background levels and downwind emission levels. Three types of samples were obtained during the study to measure ambient air concentrations and emission patterns. All sampling was performed with systems which employed polyurethane foam (PUF) cartridges for collection of PCBs from the ambient air. a) Battery-operated, personal-type pumps were used to sample during 8-hour daytime periods at a fixed height above hot spots and at upwind locations. b) EPA high-volume systems were used to sample for 8- and 24-hour periods at hot spots and upwind and downwind points. c) Arrays of five battery-operated sampling systems operated at different heights above ground level were used to determine the vertical concentration profiles at hot spot areas during 8-hour daytime periods. The quantity of PCBs collected in the PUF cartridges during sampling was determined by extraction and analysis of the extract by electron-capture gas chromatography using EPA Method 608. Meteorological conditions (wind speed and direction, temperature, and relative humidity) were monitored during sampling at the sites to assist in interpretation of the PCB measurements.

This study was conducted to provide EPA Region V with data on background airborne levels and the magnitude and distribution of PCB emissions into the atmosphere on and around the three landfill areas. EPA Region V will use results to assess the impact of the PCB emissions from the landfills on the public welfare and to determine the need for remedial action to reduce the emissions into the environment.

SECTION 2

CONCLUSIONS

a) PCB levels measured at hot spots on the landfills exceeded upwind background levels, thus indicating that PCBs from the leaking capacitors are being emitted into the air.

b) Based on measurements at hot spots, it appears that PCB emission levels are generally correlated with the number of exposed, leaking capacitors. In general, higher concentrations were measured at locations where more capacitors were visible at or above ground level.

c) PCB concentrations which exceeded background (upwind) levels were observed at sampling locations downwind of the landfills.

d) Airborne PCB concentrations above hot spots vary with height; levels at 2 cm above ground level are from 40 to 100 times higher than the levels at an elevation of 180 cm.

e) Unseasonably warm, dry weather that prevailed during the monitoring program probably maximized PCB emissions. Thus, levels observed during this study may represent "upper limit" values.

f) The methodology employed to measure PCB levels in the ambient air performed well. Quality assurance data gathered during the study demonstrates that both the low and high volume methods yielded reliable, reproducible data and that comparable results are obtained by the two methods.

SECTION 3

RECOMMENDATIONS

In general, the equipment and procedures used for the PCB measurements were relatively trouble-free and, therefore should be applicable to similar future studies. The major equipment problem was failure of motors in the high volume samplers. Replacement of the conventional motor in the high volume sampler with a by-pass type is recommended to improve the operating reliability of these units.

SECTION 4

EXPERIMENTAL PROCEDURES

SITE/SAMPLING LOCATION DESCRIPTIONS

The three landfills at which PCB monitoring was performed are located in a westerly direction and within approximately a 15-mile radius of the city of Bloomington, IN. The respective locations of the landfills are shown on the map segment presented in Figure 1. Brief descriptions of the landfill sites and sampling locations at each site follow.

Neal's Landfill

Neal's Landfill is located in Monroe County, directly north of Route 48, approximately 4.5 miles west of Bloomington, IN. The landfill is located on privately-owned property. In general, the landfill proper is heavily overgrown with weeds and brush. Several dirt lanes permit use of vehicles for transit within the landfill area. The west, north, and east extremities of the site are bordered by wooded areas. The general area is rather remote and very lightly populated; the nearest residences being located south of the landfill along Route 48. The closest residence is approximately 180 m (600 ft) from the landfill proper and is located near the gate to the landfill area. Preliminary visual surveys have identified approximately eight different areas on the landfill where PCB-containing capacitors are visible at or above ground level.

PCB monitoring at Neal's Landfill was performed at the 10 locations shown in Figure 2. Five locations, designated A through E, were localized areas (hot spots) on the landfill proper where leaking capacitors were visible at or above ground level. At Locations A and C, approximately 10-12 capacitors were visible. At each location, the capacitors were strewn over an area of approximately 10 m^2. Locations B, D, and E were smaller areas (1-2 m^2) where one to three capacitors were exposed. Locations 1 through 4 were along the northern perimeter of the site, nominally downwind from the fill area. Distances from the edge of the fill area to these sampling locations ranged from approximately 12 m (Location 2) to 64 m (Location 4). Selection of the downwind monitoring locations was constrained by heavily wooded areas along the northern boundary of the site. The upwind monitoring point (U) was located near the gate at the entrance to the landfill site.

Lemon Lane Landfill

The landfill is located south off Lemon Lane Road on the western edge of the city of Bloomington, IN. The landfill encompasses approximately 7 acres

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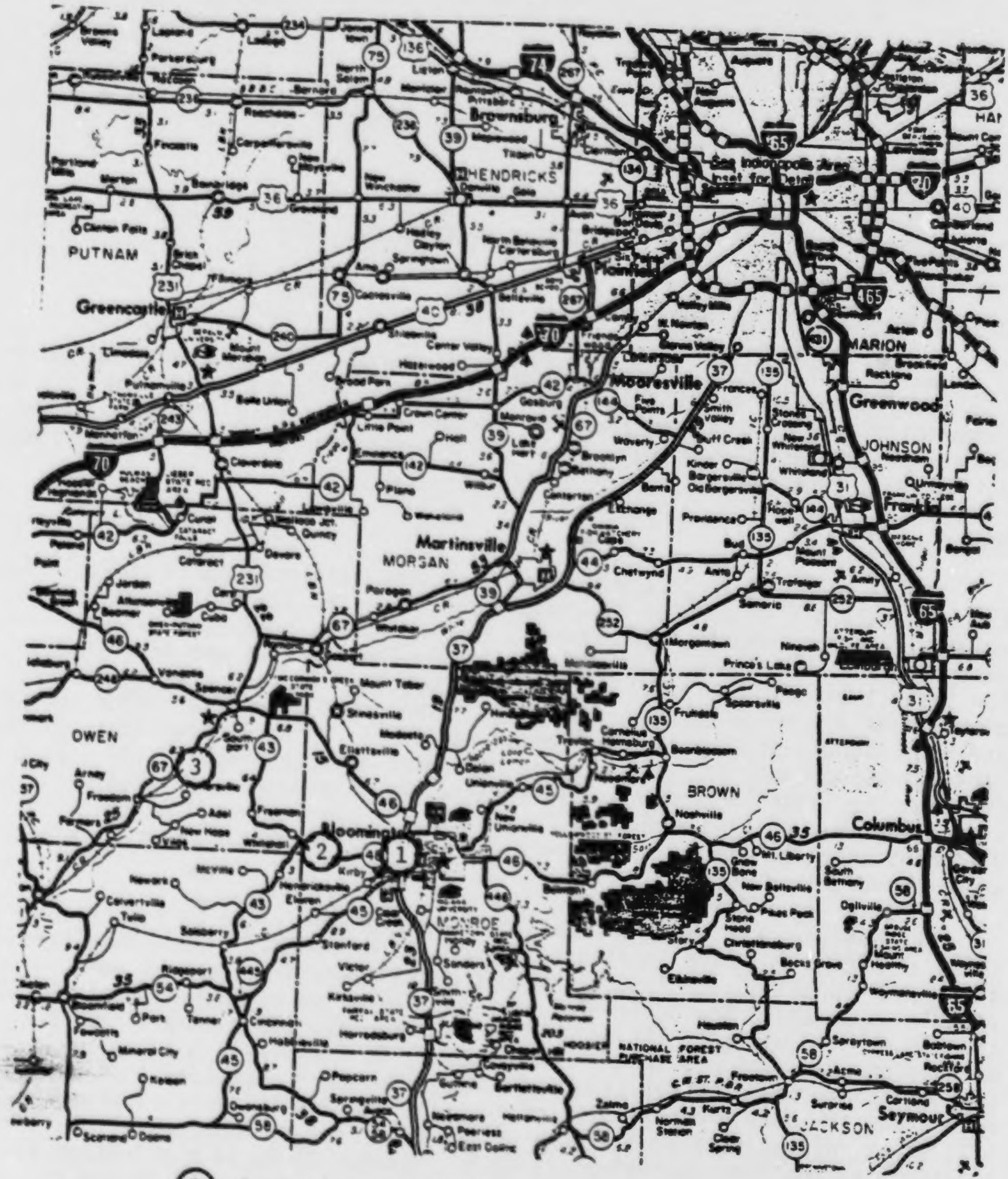
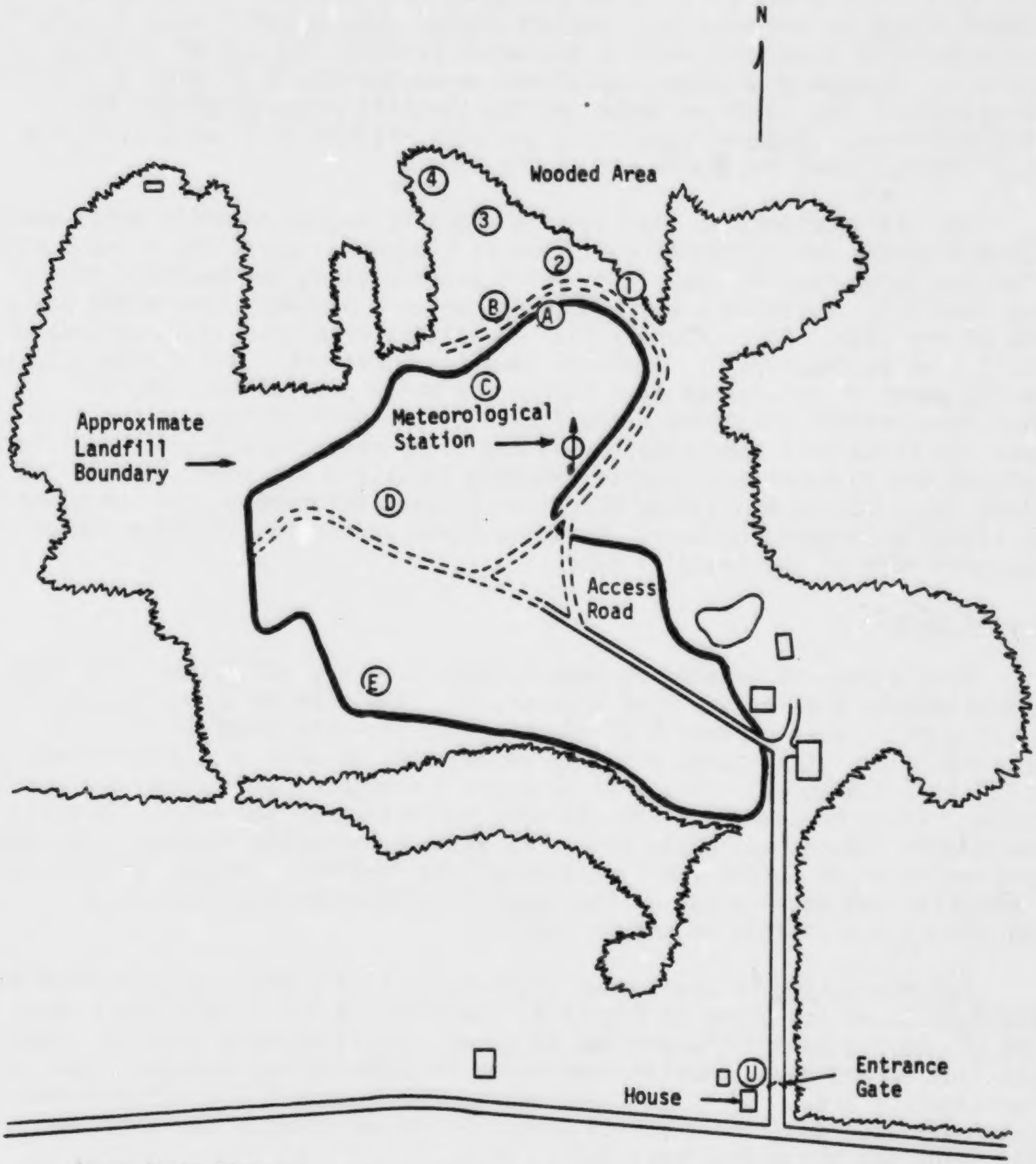

PUTNAM
HENDRICKS
MARION
MORGAN
JOHNSON
OWEN
BROWN
MONROE
JACKSON
Greencastle
Brownsburg
Mooresville
Greenwood
Martinsville
Franklin
Bloomington
Columbus
Seymour
NATIONAL FOREST PURCHASE AREA
1
2
3

① Lemon Lane Landfill

② Neal's Landfill

③ Neal's Dump

Figure 1. Location of landfill sites.


N
Wooded Area
4
3
2
1
B
A
C
Meteorological Station
Approximate Landfill Boundary
D
Access Road
E
U
Entrance Gate
House

Approximate Distances:

1 to 2 - 43 m
2 to 3 - 46 m
3 to 4 - 27 m
A to 2 - 12 m
C to 4 - 64 m

Figure 2. Monitoring locations at Neal's Landfill.

and is situated on property owned by the city of Bloomington. The site is bordered on the north by a row of residences along Lemon Lane Road, on the east by a lightly wooded area, on the south by a railroad track and a cemetery, and on the west by a pasture field. The landfill area is heavily overgrown with brush and small trees which restrict the use of vehicles on the site. A bank of exposed capacitors approximately 15 ft high is visible along most of the south perimeter of the landfill which parallels the railroad track. Exposed capacitors are also visible in an area along the west boundary near the south end of the site.

The six locations on the landfill property and surrounding areas where PCB monitoring was performed are shown in Figure 3. Locations A and B were atop the large bank of capacitors which extends along the southern edge of the landfill. Location C was alongside the west boundary toward the south end of the site. Approximately four capacitors were visible in an area of about 2 m^2 at Location C. Downwind sampling Locations 1 and 2 were situated in the yards of residences that border the north side of the landfill. Distances between Locations 1 and 2 and the northern section of the site security fence were approximately 30 and 10 m, respectively and the distance between the downwind and on-site sampling locations was approximately 300 m (1000 ft). Upwind monitoring (Location U) was performed behind the mausoleum at Valhalla Gardens Cemetery. Location U was approximately 300 m SSW of the southern edge of the landfill site.

Neal's Dump

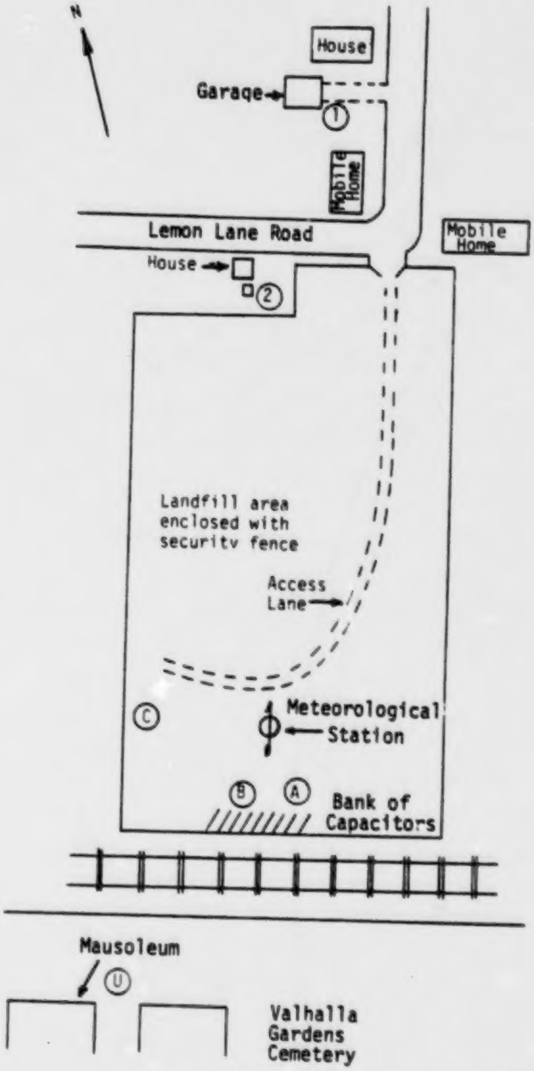
Neal's Dump is located in Owen County, directly off Potterville Road, approximately 4 miles south of Spencer, IN. The site is approximately 21 driving miles west-northwest of Bloomington, IN. The landfill which is located on privately-owned property encompasses an area of approximately 100 x 200 ft (~0.5 acres). The site is heavily overgrown with weeds and small brush. Woods border the north and west perimeters of the site. Several residences (houses and house trailers) along Potterville Road are situated on properties which border the east side of the landfill. Visual surveys have identified two small areas on the landfill site where PCB-containing capacitors are visible at ground level.

PCB monitoring on and in the vicinity of Neal's Dump was performed at the four locations shown in Figure 4. Locations A and B were small areas (~1 m^2) on the landfill where two to three capacitors were visible. Sampling Location DW was near a mobile home which is situated approximately east of the landfill area. Location U was near a mobile home situated south and generally upwind of the landfill area. Distances between the sampling locations are shown in Figure 4.

EQUIPMENT

PCB Sampling Systems

The PCB field monitoring was performed using low-volume and high-volume sampling systems developed and evaluated by Lewis, et al.(1,2,3) The


N
House
Garage
①
Mobile Home
Lemon Lane Road
Mobile Home
House
②
Landfill area enclosed with security fence
Access Lane
Ⓒ
Meteorological Station
Ⓑ
Ⓐ
Bank of Capacitors
Mausoleum
Ⓤ
Valhalla Gardens Cemetery

① ~30 m from security fence along northern boundary and ~300 m from hot spots

② ~10 m from security fence along northern boundary and ~300 m from hot spots

Ⓤ ~300 m upwind of the southern boundary

Figure 3. Monitoring locations at Lemon Lane Landfill.

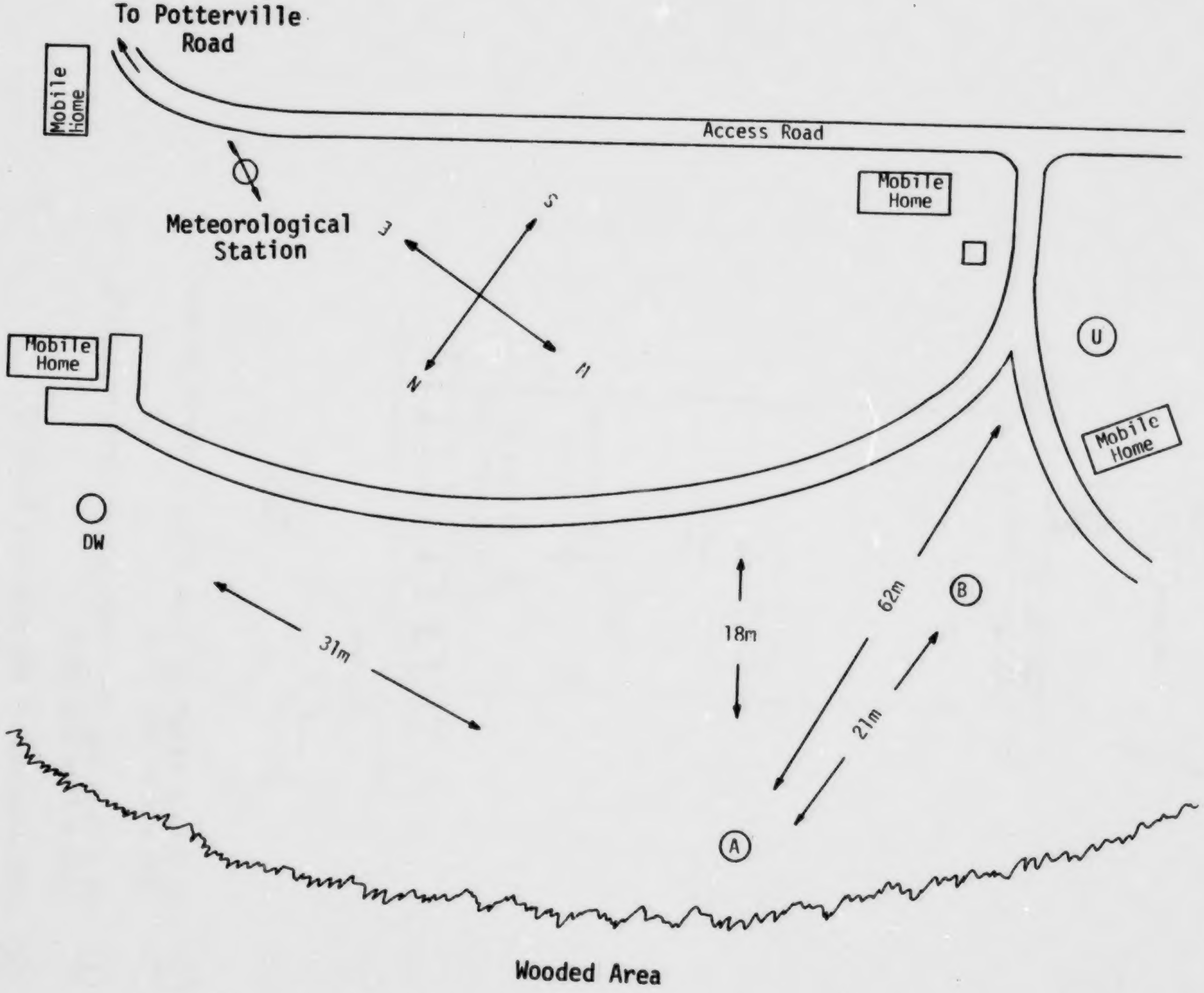

To Potterville Road
Mobile Home
Access Road
Meteorological Station
Mobile Home
S
E
N
W
Mobile Home
U
Mobile Home
DW
31m
18m
62m
21m
B
A
Wooded Area

Figure 4. Monitoring locations at Neal's Dump.

components of the low volume sampling system, (shown in Figure 5) consist of a DuPont P-4000A, battery-operated, constant flow sampling pump and a polyurethane foam (PUF) cartridge to remove PCBs from the sampled air. The pumps operate on battery power for at least 8 hours at approximately 3.8 L/min; the flow rate which was used for the PCB sampling. LED indicators in the unit show battery charge level, low flow during sampling, and elapsed sampling time.

The sampling cartridges consist of a 20 mm (i.d.) x 10 cm long borosilicate glass tube into which is fitted, under slight compression, a 22 mm dia. x 7.6 cm long cylinder of PUF. The exit end of the glass envelope is drawn down to 7 mm (o.d.) to permit coupling the PUF cartridge to the pump inlet with a section of Tygon tubing.

The components of the EPA high volume sampler are shown in Figure 6. The system consists of a conventional high volume sampler modified by addition of an inlet head which accommodates a PUF sampling cartridge. The sampling head is comprised of an aluminum housing which holds a 10 cm diameter particulate filter (Pallflex 2500 QAST quartz) followed by a glass sampling cartridge containing a PUF plug. The sampling cartridge is constructed from a 60 mm i.d. x 125 mm borosilicate glass cylinder, into which is fitted, under a slight compression, a 62 mm o.d. x 7.6 cm PUF plug. The PUF plug is held in place by a screen supported on indentations near the bottom of the glass cylinder. Silicone rubber gaskets are used at each end of the cartridge to seal it in the sampler head.

For PCB sampling, the high volume unit is throttled to a flow rate of approximately 0.226 m^3/min (~8 cfm). A calibrated venturi tube with attached Magnehelic gauge provides a measure of the sampler flow rate. Other components in the system include a valve to regulate flow, a Variac to control motor speed, and an elapsed timer. A duct attached to the motor was used to direct the exhaust downwind from the sampler. At remote locations where line power was not available, the high volume samplers were operated from 1500 W gasoline-powered motor generators placed approximately 10 m downwind from the high volume sampling units. The motor generators were fitted with 5-gallon gasoline tanks to permit operation for about 18 hours between refueling.

Meteorological Stations

Continuous measurements of wind speed, wind direction, and ambient temperature were obtained with Meterology Research, Inc. portable weather stations. One station was operated at Neal's Landfill during the entire field sampling program. Another system was operated at Neal's Dump and Lemon Lane Landfill during the sampling periods at these sites.

Relative humidity was determined from wet- and dry-bulb temperature measurements.

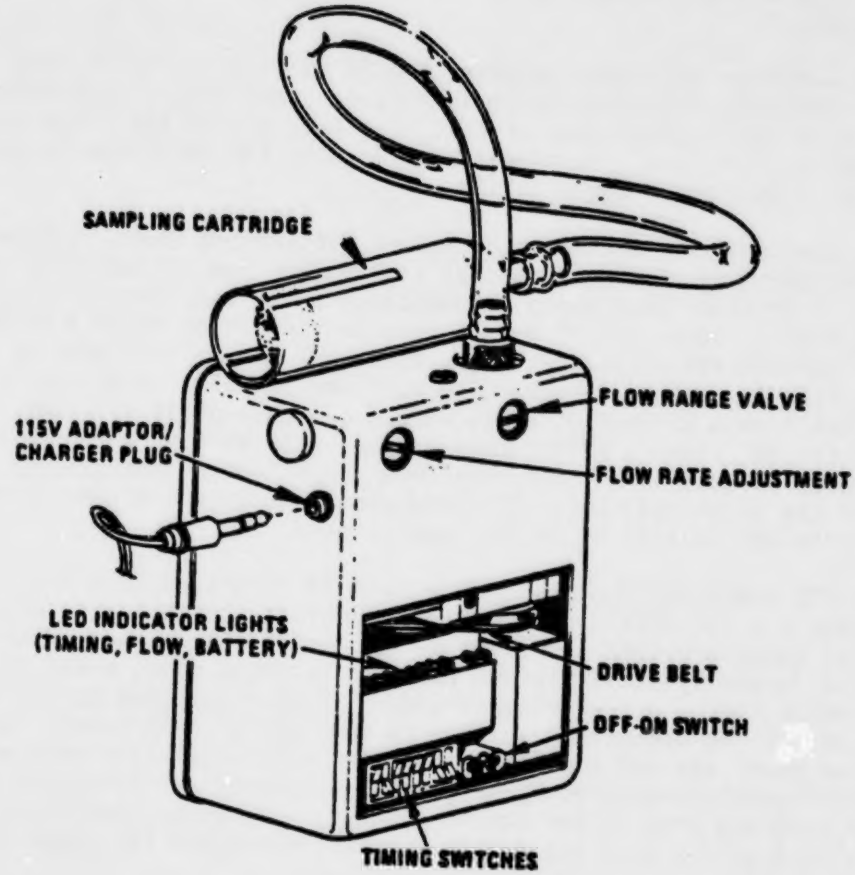

SAMPLING CARTRIDGE
115V ADAPTOR/ CHARGER PLUG
FLOW RANGE VALVE
FLOW RATE ADJUSTMENT
LED INDICATOR LIGHTS (TIMING, FLOW, BATTERY)
DRIVE BELT
OFF-ON SWITCH
TIMING SWITCHES

Figure 5. Low volume PCB sampler.

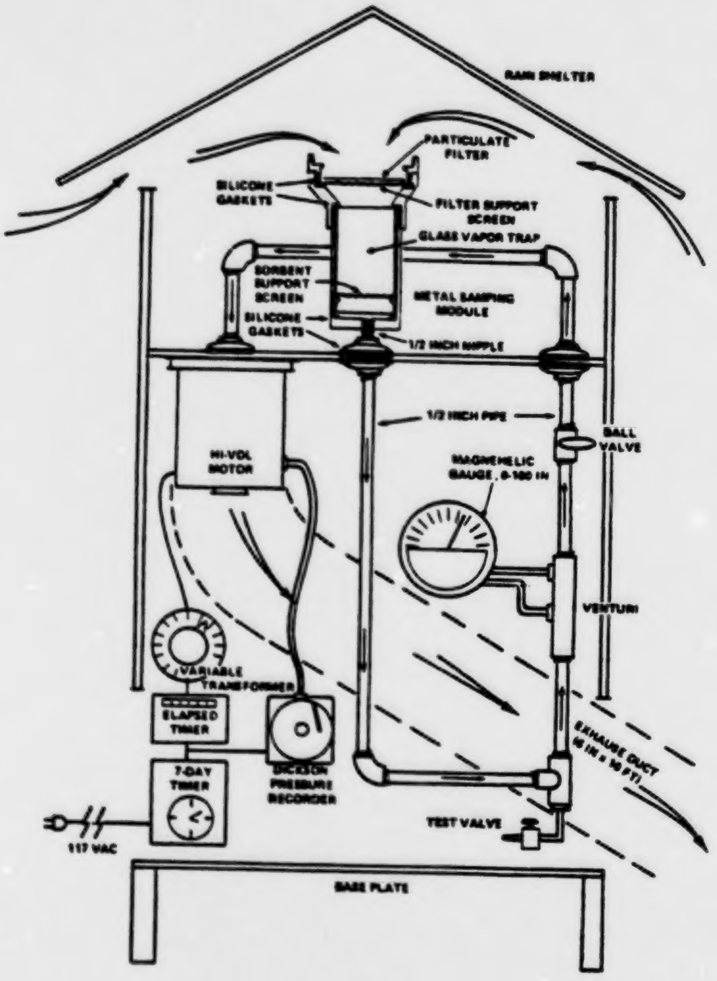

RAIN SHELTER
PARTICULATE FILTER
SILICONE GASKETS
FILTER SUPPORT SCREEN
GLASS VAPOR TRAP
SORBENT SUPPORT SCREEN
METAL SAMPING MODULE
SILICONE GASKETS
1/2 INCH NIPPLE
1/2 INCH PIPE
BALL VALVE
HI-VOL MOTOR
MAGNEHELIC GAUGE, 0-100 IN
VENTURI
VARIABLE TRANSFORMER
ELAPSED TIMER
DICKSON PRESSURE RECORDER
EXHAUST DUCT (10 IN x 10 FT)
7-DAY TIMER
TEST VALVE
117 VAC
BASE PLATE

Figure 6. EPA high volume ambient air sampler.

PCB MONITORING PROCEDURES

Three different sampling procedures i.e., a) low-volume, b) vertical profile, and c) high-volume were used to measure ambient air PCB concentrations and emission patterns on and in the vicinity of the landfill sites. These procedures were adapted from the protocol developed by Lewis, et. al.(4,5) for monitoring hazardous waste sites.

DuPont P-4000A battery-operated, low volume samplers (flow rate ~3.8 L/min) were used to sample the ambient air at hot spots on the landfill sites and at upwind locations. The samplers were positioned with inlets of the PUF cartridges at 1.8 m above ground level. Sampling at hot spots was performed immediately downwind of the hot spot area over 8-hr day-time periods from approximately 0900 to 1700 hrs CDT.

Measurements of the vertical PCB concentration profiles were performed with a vertical array of five DuPont low volume samplers. The array was positioned directly over a hot spot area with inlets of the PUF cartridges at 2, 30, 60, 120, and 180 cm above ground level. Sampling was performed for 8-hr periods from approximately 0900 to 1700 hrs CDT.

EPA high volume systems (flow rate ~8 cfm) were used to collect 8- or 24-hr samples upwind of the sites, at hot spots on the sites, and along the downwind perimeter of the sites. The EPA samplers were situated with the inlets approximately 1.2 m above ground level and were located, to the extent possible, in areas where air flow was unrestricted in the windward direction.

At hot spots, the high volume samplers were positioned immediately downwind of the hot spot area. Eight-hour samples were collected concurrently with the low volume samples, i.e., during sampling periods from approximately 0900 to 1700 CDT. The 24-hr samples were collected from approximately 0800 hr to 0800 hr the following day.

The types and locations of samples collected at each site are summarized in Table 1 and discussed in the following sections. Detailed descriptions of the low- and high-volume sampling procedures are provided in Appendix A.

Neal's Landfill

Monitoring at Neal's Landfill was conducted on June 29 and 30 and July 12 and 14, 1983. The following sampling was performed each day of the four-day monitoring program. Monitoring with low volume samplers was performed at five different hot spot locations on the site and at a location along the upwind perimeter of the site. Vertical profile measurements were made at two of the five hot spots. High volume samples were obtained at one upwind location, two hot spot areas on the site, and at four locations along the downwind perimeter of the site. High volume samples were collected for 8-hr periods at hot spots to provide data for comparison with the low volume measurements. High volume samples were also collected to obtain a 24-hr average of the PCB concentrations at hot spots. At one downwind location, high volume samples were collected for an 8-hr period and 24-hr sampling was performed at the other three locations. Motor generator units were used to

TABLE 1. SAMPLING PROGRAM SUMMARY

Site/Sampling Dates (1983)	Sampling Location(a)	Type of Sampling Performed(b)
Neal's Landfill June 29 and 30 July 12 and 14	HS-A	8hrLV, 8hrHV, 24hrHV, 8hrVP
	-B	8hr LV
	-C	8hrLV, 8hrHV, 24hrHV, 8hrVP
	-D	8hrLV
	-E	8hrLV
	DW-1	8hrHV
	-2	24hrHV
	-3	24hrHV
	-4	24hrHV
	UW	8hrLV 24hrHV
Neal's Dump June 29 and 30 July 12	HS-A	8hrLV, 8hrHV
	HS-B	8hrLV
	DW	24hrHV
	UW	8hrLV 24hrHV
Lemon Lane Landfill July 17, 18, 20, and 21	HS-A	8hrLV, 8hrHV, 24hrHV
	HS-B	8hrLV
	HS-C	8hrLV, 8hrHV, 24hrHV, 8 hrVP
	DW-1	24hrHV
	DW-2	24hrHV
	UW	8hrLV, 24hrHV

(a) HS - hot spot, DW - downwind, and UW - upwind.
(b) LV - DuPont low volume sampler, HV - EPA high volume sampler, and VP - in-line vertical array of five DuPont low volume samplers.

provide electrical power for the high volume samplers operated at the hot spots and along the downwind perimeter of the site.

Neal's Dump

Monitoring at Neal's Dump was performed on June 29 and 30 and July 12, 1983, concurrently with the sampling activities at Neal's Landfill. The following sampling was performed each day of the three-day monitoring program. Low volume sampling was performed at two different hot spots on the site and at a location upwind of the site. High volume samples were obtained at one upwind location, one hot spot on the site, and one downwind location. During the three days, high volume samples at the hot spot location were collected over 8-hr periods to provide data for comparison with the low volume measurements. All upwind and downwind high volume samples were collected for 24-hr periods. Vertical profile measurements were not performed at Neal's Dump.

Lemon Lane Landfill

Four days of monitoring were conducted at Lemon Lane Landfill on the following dates; July 17, 18, 20, 21, 1983. The following sampling was performed each day of the four-day monitoring program. Low volume sampling was performed at three different hot spot locations on the site and at one location upwind of the site. High volume samples were obtained at one upwind location, two hot spots on the site, and at two locations along the downwind perimeter of the site. At the hot spots, high volume sampling was performed both for 8-hr and 24-hr periods. The 8-hr samples were collected concurrently with the low volume samples to provide data to compare measurements made by the two techniques. All upwind and downwind sampling were performed for 24-hr periods. Motor generator units were used to provide electrical power for the high volume samplers operated at hot spot areas. Units at the upwind and downwind locations were operated from line power. Vertical profile measurements were performed at one hot spot.

SAMPLE HANDLING

Strict chain-of-custody procedures as described in the NEIC Manual(6) were employed to the extent possible in all sample handling activities associated with this study. On-site visual surveillance was maintained during all daytime sampling periods to ensure that there was no tampering with the sampling systems. The high volume units used for 24 hr sampling were sealed with locks during unattended nighttime operation.

Immediately after removal from the samplers, all PUF cartridges coded with a unique sample number were returned to sealed glass bottles. The bottle caps were then sealed with chain-of-custody tape and stored in an ice chest at about 4 C until shipment to Southwest Research Institute (SwRI), San Antonio, Texas, for PCB analysis. All transfers of clean PUF cartridges and field samples were accompanied by chain-of-custody forms.

PCB ANALYSIS PROCEDURE

Analysis for PCBs in the PUF cartridges (and high volume filters) was performed according to the procedure described in the EPA Manual of Analytical Methods(7). The steps in the analysis procedure included; a) Soxhlet extraction of the foam plugs (and filters in the case of high volume samplers) with 5 percent ether in hexane; b) concentration of the extract to 1 mL and c) determination of PCBs in an aliquot of the extract by electron capture-gas chromatography using EPA Method 608(8). Identification and quantification of Aroclor 1242 and 1260 in the samples was performed by the technique described by Webb and McCall(9).

PCB analyses were performed by SwRI. A stepwise description of the analytical procedure which was used is given in Appendix B.

METEOROLOGICAL MEASUREMENTS

Continuous measurements of wind speed, wind direction, and ambient temperature were performed with Meteorological Research, Inc. (MRI) portable weather stations. One unit was located at Neal's Landfill during the entire study. A second unit was used to collect meteorological data at Neal's Dump and Lemon Lane Landfill during the PCB monitoring periods at these sites. Strip chart data from the meteorological systems was manually reduced to obtain hourly averages. Relative humidity data were obtain from wet- and dry-bulb temperature measurements made periodically during daytime sampling periods.

SECTION 5

RESULTS AND DISCUSSION

The PCB concentrations measured in ambient air at locations on and in the vicinity of Neal's Landfill, Neal's Dump, and Lemon Lane Landfill are presented in Tables 2, 3, and 4, respectively. Field sampling data associated with collection of the samples at each site are given in Appendix C. Meteorological data recorded during the field study are presented in Appendix F.

The monitoring results from the low volume sampling show that PCBs are being introduced into the atmosphere from leaking capacitors at each of the three landfills. Generally, the airborne levels measured at hot spots on the sites appear to correlate with the number of exposed, leaking capacitors. The highest PCB concentrations in ambient air were found on Lemon Lane Landfill. At this site, levels measured in three different areas with exposed capacitors during 8-hour daytime periods ranged from 6 to 193 µg/scm. The highest values (40 to 193 µg/scm) were observed at Hot Spots A and B which were immediately above the large bank of exposed capacitors along the south end of the site. PCB levels measured by low volume sampling at the five hot spots on Neal's Landfill during 8-hour daytime periods ranged from 0.4 to 20 µg/scm. The highest levels were observed at Hot Spots A, C, and E. The two former locations were areas where several (10-12) leaking capacitors were evident. The higher levels found at Hot Spot E are somewhat unexpected since the area is similar to Hot Spots B and D with only two or three exposed capacitors. At Neal's Dump, PCB concentrations detected at two hot spots during 8-hour daytime monitoring with low volume samplers ranged from 0.6 to 19 µg/scm. The highest levels (11 to 19 µg/scm) were found at Hot Spot A.

PCB emissions from the leaking capacitors were also detected in the ambient air downwind from the landfill areas. At Neal's Landfill, PCB concentrations measured at four downwind locations ranged from 0.2 to 1.8 µg/scm with the highest values being observed at the locations closest (~12-30 m) and most directly downwind of the hot spots. During the monitoring period, PCB levels measured at a location upwind of Neal's Landfill were ≤0.1 µg/scm. The PCB levels found at two locations downwind of Lemon Lane Landfill ranged from 0.3 to 0.8 µg/scm. The downwind sampling locations were approximately 0.3 to 0.4 km from the hot spots on the landfill. Background PCB concentrations measured upwind of Lemon Lane Landfill were <0.1 µg/scm. PCB levels determined at locations designated upwind and downwind of Neal's Dump did not show a significant difference. However, the samplers could not be placed at the optimum upwind/downwind locations due to unavailability of electrical power and to interference from the heavily wooded area nominally downwind of the landfill.

TABLE 2. RESULTS OF PCB MONITORING AT NEAL'S LANDFILL

Sampling Date	Sampling Location	Sample Type	Sampling Period, Hrs CDT		Sampling Time, min	Avg. Sampling Rate, L/min(b)	Total Sample Volume, scm	PCB Collected, µg	PCB Conc. in Ambient Air, µg/scm(c)
			Start	Stop(a)					
6/29/83	HS-A	8 hr LV	0941	1737	476	3.559	1.69	16	9.4
		8 hr LV	0941	1737	476	3.550	1.69	19	11
		24 hr HV	0841	0839*	1438	226	325	3900	12
		24 hr HV	0844	0839*	1435	226	324	4400	14
		VP-2	0947	1740	473	3.681	1.74	1700	977
		VP-30	0947	1740	473	3.568	1.69	170	101
		VP-60							(d)
		VP-120	0947	1740	473	3.700	1.75	40	23
		VP-180	0947	1740	473	3.590	1.70	17	10
	HS-B	8 hr LV	0934	1731	477	3.571	1.70	3.9	2.3
	HS-C	8 hr LV	0923	1717	474	3.576	1.70	15	8.8
		8 hr LV	0923	1717	474	3.666	1.74	15	8.6
		8 hr HV	0913	1711	478	227	109	1500	14
		VP-2	0930	1723	473	3.626	1.72	1900	1108
		VP-30	0930	1723	473	3.632	1.72	270	157
		VP-60	0930	1723	473	3.598	1.70	98	58
		VP-120	0930	1723	473	3.606	1.71	35	21
		VP-180	0930	1723	473	3.660	1.73	18	10
	HS-D	8 hr LV	0957	1752	475	3.592	1.71	0.93	0.5
	HS-E	8 hr LV	0955	1759	484	3.560	1.72	19	11
	UW	8 hr LV	1002	1803	481	3.584	1.72	0.12	0.07
		24 hr HV	0802	0801*	1421	224	318	24	0.08
	DW-1	8 hr HV	0832	1655	503	226	114	20	0.2
	DW-2	24 hr HV	0837	0828*	1431	227	325	270	0.8
	DW-3	24 hr HV	0851	0955*	1504	225	338	270	0.8
	DW-4	24 hr HV	0857	0953*	1496	228	341	120	0.4

TABLE 2. (Continued)

Sampling Date	Sampling Location	Sample Type	Sampling Period, Hrs CDT Start	Sampling Period, Hrs CDT Stop(a)	Sampling Time, min	Avg. Sampling Rate, L/min(b)	Total Sample Volume, scm	PCB Collected, µg	PCB Conc. in Ambient Air, µg/scm(c)
6/30/83	HS-A	8 hr LV	0901	1655	474	3.695	1.75	19	11
		8 hr LV	0901	1655	474	3.713	1.76	12	6.8
		24 hr HV	0949	0630*	1241	226	280	3100	11(e)
		24 hr HV	0948	0630*	1242	226	281	3300	12(e)
		VP-2	0858	1659	481	3.762	1.81	1000	552
		VP-30	0858	1659	481	3.737	1.80	100	56
		VP-60	0858	1659	481	3.660	1.76	53	30
		VP-120	0858	1659	481	3.542	1.70	17	10
		VP-180	0858	1659	481	3.566	1.72	11	6.4
	HS-B	8 hr LV	0928	1722	474	3.707	1.76	2.6	1.5
	HS-C	8 hr LV	0913	1713	480	3.550	1.70	12	7.0
		8 hr HV	0942	1713	451	227	102	1200	12
		VP-2	0910	1708	478	3.550	1.70	1600	941
		VP-30	0910	1708	478	3.569	1.71	190	111
		VP-60	0910	1708	478	3.718	1.78	78	44
		VP-120	0910	1708	478	3.710	1.77	28	16
		VP-180	0910	1708	478	3.658	1.75	15	8.6
	HS-D	8 hr LV	0936	1731	475	3.780	1.80	0.76	0.4
	HS-E	8 hr LV	0936	1735	479	3.684	1.77	13	7.3
	UW	8 hr LV	0940	1743	483	3.706	1.79	0.15	0.08 (f)
		24 hr HV							
	DW-1	8 hr HV	0838	1650	492	226	111	52	0.5
	DW-2	24 hr HV	0849	0849	0750	228	328	280	0.9
	DW-3	24 hr HV	1010	1008	1438	225	324	270	0.8
	DW-4	24 hr HV	1005	1005	1440	226	325	86	0.3

TABLE 2. (Continued)

Sampling Date	Sampling Location	Sample Type	Sampling Period, Hrs CDT		Sampling Time, min	Avg. Sampling Rate, L/min(b)	Total Sample Volume, scm	PCB Collected, µg	PCB Conc. in Ambient Air, µg/scm(c)
			Start	Stop(a)					
7/12/83	HS-A	8 hr LV	0850	1656	486	3.628	1.76	15	8.5
		8 hr HV	0852	1701	489	226	111	2200	20
		VP-2	0846	1646	480	3.558	1.71	1800	1053
		VP-30	0847	1648	481	3.642	1.75	210	120
		VP-60	0848	1652	484	3.611	1.75	86	49
		VP-120	0849	1653	484	3.583	1.73	33	19
		VP-180	0850	1655	485	3.674	1.78	20	11
	HS-B	8 hr LV	0900	1710	490	3.551	1.74	5.8	3.3
	HS-C	8 hr LV	0908	1716	488	3.521	1.72	19	11
		8 hr LV	0908	1716	488	3.642	1.78	21	12
		24 hr HV	0816	0816	1440	227	327	2700	8.3
		24 hr HV							(g)
		VP-2	0918	1720	482	3.682	1.78	1800	1011
		VP-30							(h)
		VP-60	0918	1720	482	3.692	1.78	110	62
		VP-120	0918	1720	482	3.565	1.72	5.8	3.4(i)
		VP-180	0918	1720	482	3.702	1.78	28	16(i)
	HS-D	8 hr HV	0928	1738	490	3.554	1.74	2.2	1.3
	HS-E	8 hr HV	0932	1742	490	3.732	1.83	33	18
	UW	8 hr LV	0940	1749	489	3.548	1.74	<0.08	<0.05
		24 hr HV							(f)
	DW-1	8 hr HV	0855	1707	492	222	109	48	0.4
	DW-2	24 hr HV	0750	0750	1440	228	328	480	1.5
	DW-3	24 hr HV	0800	0800	1440	227	327	580	1.8
	DW-4	24 hr HV	0807	0807	1440	229	330	160	0.5

TABLE 2. (Continued)

Sampling Date	Sampling Location	Sample Type	Sampling Period, Hrs CDT Start	Sampling Period, Hrs CDT Stop(a)	Sampling Time, min	Avg. Sampling Rate, L/min(b)	Total Sample Volume, scm	PCB Collected, µg	PCB Conc. in Ambient Air, µg/scm(c)
7/14/83	HS-A	8 hr LV	0857	1654	477	3.720	1.77	9.0	5.1
		8 hr LV	0857	1654	477	3.672	1.75	9.2	5.3
		8 hr HV	0853	1651	478	226	108	1400	13
		VP-2	0907	1707	480	3.745	1.80	1200	667
		VP-30	0904	1704	480	3.704	1.78	160	90
		VP-60	0902	1702	480	3.729	1.79	66	37
		VP-120	0900	1701	481	3.719	1.79	30	17
		VP-180	0900	1659	479	3.644	1.75	23	13
	HS-B	8 hr LV	0848	1647	479	3.632	1.74	3.0	1.7
	HS-C	8 hr LV	0836	1636	480	3.689	1.77	9.4	5.3
		24 hr HV	0834	1628	476	226	108	57	5.2(e)
		24 hr HV							(g)
		VP-2	0841	1639	478	3.684	1.76	1060	602
		VP-30	0841	1639	478	3.669	1.75	200	114
		VP-60	0841	1639	478	3.658	1.75	70	40
		VP-120	0841	1639	478	3.652	1.75	27	15
		VP-180	0841	1639	478	3.640	1.74	19	11
	HS-D	8 hr LV	0923	1720	477	3.665	1.75	1.9	1.1
	HS-E	8 hr LV	0927	1723	476	3.675	1.75	15	8.6
	UW	8 hr LV	0935	1728	473	3.681	1.74	0.17	0.1
		24 hr HV	0758	0747	1429	226	323	28	0.09
	DW-1	8 hr HV	0917	1715	478	220	105	32	0.3
	DW-2	24 hr HV	0806	0755	1429	228	326	590	1.8
	DW-3	24 hr HV							(g)
	DW-4	24 hr HV	0817	0759	1422	222	316	220	0.7

FOOTNOTES:

a) Asterisk indicates that stop time was on the following day, i.e., sampling time was 24 hrs.
b) Liters/minute at 25 C, 760 mm Hg.
c) Reported as micrograms of Aroclor 1242 per standard cubic meter (25 C, 760 mm Hg).
d) Low flow indication during sampling, sample voided.
e) Motor generator stopped before end of 24 hr sampling period, sampling time taken from HV timer.
f) Power disconnected at residence.
g) Sampler motor failed.
h) Hose connecting PUF and pump came off during sampling, sample voided.
i) Low flow indication during sampling, results questionable.

TABLE 3. RESULTS OF PCB MONITORING AT NEAL'S DUMP

Sampling Date	Sampling Location	Sample Type	Sampling Period, Hrs CDT		Sampling Time, min	Avg. Sampling Rate, L/min(b)	Total Sample Volume, scm	PCB Collected, µg	PCB Conc. in Ambient Air, µg/scm(c)
			Start	Stop(a)					
6/29/83	HS-A	8 hr LV	0902	1706	484	3.615	1.75	20	11
		8 hr HV	0859	1706	487	225	110	2900	26(d)
	HS-B	8 hr LV	0907	1701	474	3.646	1.73	5.1	3.0
	UW	8 hr LV	0830	1658	508	3.606	1.83	0.12	0.07
		24 hr HV	0825	0826*	1441	231	333	65	0.2
	DW	24 hr HV	0841	0842*	1441	222	320	91	0.2
6/30/83	HS-A	8 hr LV	0907	1703	476	3.746	1.78	14	7.9
		8 hr LV	0907	1703	476	3.675	1.75	16	9.1
		8 hr HV	0906	1710	484	226	109	2500	23(d)
	HS-B	8 hr LV	0910	1724	494	3.487	1.72	0.96	0.6
	UW	8 hr LV	0913	1719	486	3.726	1.81	<0.08	<0.04
		24 hr HV	0838	0824*	1426	226	322	27	0.08
	DW	24 hr HV	0850	0830*	1410(e)	225	317	36	0.1
7/12/83	HS-A	8 hr LV	0927	1720	473	3.588	1.70	31	18
		8 hr LV	0927	1720	473	3.544	1.68	32	19
		8 hr HV	0915	1715	480	217	104	3800	37
		8 hr HV	0915	1745	465(f)	223	104	6300	61
	HS-B	8 hr LV	0933	1733	480	3.644	1.75	0.98	0.6
	UW	8 hr LV	0935	1728	473	3.682	1.74	<0.08	<0.04
		24 hr HV	0823	0805*	1422	229	326	52	0.2
	DW	24 hr HV	0815	0800*	1425	226	322	25	0.08

FOOTNOTES:

a) Asterisk indicates that stop time was on the following day, i.e., sampling time was ~24 hrs.
b) Liters/minute at 25 C, 760 mm Hg.
c) Reported as micrograms of Aroclor 1242 per standard cubic meter (25 C, 760 mm Hg).
d) Post sampling flow calibration unacceptable, results questionable due to uncertainty in sampler flow rate.
e) Sampler down 10 minutes to change HV motor.
f) Sampler down 45 minutes (1130-1215 hrs).

TABLE 4. RESULTS OF PCB MONITORING AT LEMON LANE LANDFILL

Sampling Date	Sampling Location	Sample Type	Sampling Period, Hrs CDT Start	Sampling Period, Hrs CDT Stop[(a)]	Sampling Time, min	Avg. Sampling Rate, L/min[(b)]	Total Sample Volume, scm	PCB Collected, µg	PCB Conc. in Ambient Air, µg/scm[(c)]
7/17/83	HS-A	8 hr LV	0851	1700	489	3.719	1.82	72	40
		8 hr LV	0851	1700	489	3.693	1.81	50	28(d)
		8 hr HV	0800	1700	540	227	123	12,000	98
		8 hr HV	0800	1700	540	228	128	11,000	89
		24 hr HV							(e)
	HS-B	8 hr LV	0851	1700	489	3.746	1.83	110	60
	HS-C	8 hr LV	0845	1700	495	3.794	1.88	27	14
		8 hr HV	0829	1700	511	226	115	3500	30
		8 hr HV	0835	1738	543	225	122	5700	47
		24 hr HV							(f)
		VP-2	0845	1700	495	3.797	1.88	690	367
		VP-30	0845	1700	495	3.807	1.88	100	53
		VP-60	0845	1700	495	3.782	1.87	52	28
		VP-120	0845	1700	495	3.800	1.88	31	16
		VP-180	0845	1700	495	3.728	1.85	16	8.6
	UW	8 hr LV	0751	1739	588	3.782	2.22	0.12	0.05
		24 hr HV	0744	0802*	1458	229	334	31	0.09
	DW-1	24 hr HV	0728	0746*	1458	221	322	250	0.8
	DW-2	24 hr HV	0717	0732*	1455	227	330	130	0.4

TABLE 4. (Continued)

Sampling Date	Sampling Location	Sample Type	Sampling Period, Hrs CDT Start	Stop(a)	Sampling Time, min	Avg. Sampling Rate, L/min(b)	Total Sample Volume, scm	PCB Collected, µg	PCB Conc. in Ambient Air, µg/scm(c)
7/18/83	HS-A	8 hr LV	0852	1700	488	3.754	1.83	92	50
		24 hr HV	0838	0830*	1432	227	325	14,000	43
		24 hr HV							(e)
	HS-B	8 hr LV	0852	1700	488	3.724	1.82	140	77
		8 hr LV	0852	1700	488	3.718	1.81	130	72
	HS-C	8 hr LV	0902	1700	478	3.763	1.80	30	17
		24 hr HV	0913	0910*	1437	226	325	6600	20
		24 hr HV	0913	0910*	1437	225	323	7300	23
		VP-2	0902	1700	478	3.740	1.79	1100	615
		VP-30	0902	1700	478	3.753	1.79	140	78
		VP-60	0902	1700	478	3.741	1.79	79	44
		VP-120	0902	1700	478	3.730	1.78	43	24
		VP-180	0902	1700	478	3.782	1.81	25	14
	UW	8 hr LV	0845	1719	514	3.721	1.91	0.09	0.05
		24 hr HV	0810	0800*	1430	226	323	28	0.09
	DW-1	24 hr HV	0752	0748*	1436	223	320	160	0.5
	DW-2	24 hr HV							(g)

TABLE 4. (Continued)

Sampling Date	Sampling Location	Sample Type	Sampling Period, Hrs CDT Start	Sampling Period, Hrs CDT Stop(a)	Sampling Time, min	Avg. Sampling Rate, L/min(b)	Total Sample Volume, scm	PCB Collected, µg	PCB Conc. in Ambient Air, µg/scm(c)
7/20/83	HS-A	8 hr LV	0902	1708	486	3.764	1.83	84	46
		24 hr LV	0810	0810*	1440	229	330	15,000	45
		24 hr HV	0810	0810*	1440	246	354	16,000	45
	HS-B	8 hr LV	0904	1709	485	3.741	1.81	170	94
	HS-C	8 hr LV	0855	1655	480	3.682	1.77	11	6.2
		8 hr LV	0855	1655	480	3.841	1.84	11	6.0
		24 hr HV	0832	0832*	1440	226	325	4300	13
		24 hr HV							(f)
		VP-2	0855	1655	480	3.606	1.73	1140	659
		VP-30	0855	1655	480	3.683	1.77	140	79
		VP-60							(h)
		VP-120							(h)
		VP-180	0855	1655	480	3.679	1.77	12	6.8
	UW	8 hr LV	0845	1657	492	3.755	1.85	0.09	0.05
		24 hr HV	0811	0747*	1416	225	319	27	0.08
	DW-1	24 hr HV	0754	0729*	1415	216	306	140	0.5
	DW-2	24 hr HV	0741	0718*	1390	223	310	87	0.3(i)

TABLE 4. (Continued)

Sampling Date	Sampling Location	Sample Type	Sampling Period, Hrs CDT		Sampling Time, min	Avg. Sampling Rate, L/min(b)	Total Sample Volume, scm	PCB Collected, µg	PCB Conc. in Ambient Air, µg/scm(c)
			Start	Stop(a)					
7/21/83	HS-A	8 hr LV	0901	1705	484	3.646	1.77	150	85
		8 hr LV	0901	1705	484	3.711	1.80	160	89
		24 hr HV							(e)
		24 hr HV							(e)
	HS-B	8 hr LV	0901	1705	484	3.729	1.81	350	193
	HS-C	8 hr LV	0855	1655	480	3.780	1.81	37	20
		24 hr HV	0845	0840*	1435	226	324	11,000	34
		24 hr HV							(e)
		VP-2	0855	1655	480	3.704	1.78	1700	955
		VP-30	0855	1655	480	3.791	1.82	290	159
		VP-60	0855	1655	480	3.745	1.80	125	69
		VP-120	0855	1655	480	3.749	1.80	60	33
		VP-180	0855	1655	480	3.698	1.78	37	21
	UW	8 hr LV	0845	1700	495	3.669	1.82	<0.08	<0.04
		24 hr HV							(f)
	DW-1	24 hr HV	0735	0806*	1471	220	324	190	0.6
	DW-2	24 hr HV	0725	0757*	1472	226	333	101	0.3

FOOTNOTES:

a) Asterisk indicates that stop time was on the following day, i.e., sampling time was 24 hrs.
b) Liters/minute at 25 C, 760 mm Hg.
c) Reported as micrograms of Aroclor 1242 per standard cubic meter (25 C, 760 mm Hg).
d) Low flow indication during sampling period, results questionable.
e) Motor generator stopped during sampling period, sample VOIDED.
f) HV motor failed, sample voided.
g) Power off at residence due to blown fuse, sample voided.
h) Pump stopped during sampling period, sample voided.
i) Power off at residence for 27 minutes due to blown fuse. Sampling time taken from HV timer.

At Neal's Landfill and Lemon Lane Landfill, measurements were performed to determine the vertical distribution of PCBs in the air above hot spots. PCB concentrations measured at a 2 cm elevation above hot spots at the two sites ranged from 367 to 1108 μg/scm with a median of 804 μg/scm. The median concentration at 180 cm elevation was 11 μg/scm, seven times lower than at the 2 cm height. Variations in the vertical concentration profiles at a given location are probably due primarily to wind conditions since the ambient temperatures were fairly uniform throughout the various sampling days.

In Tables 2, 3, and 4, data are reported for monitoring with collocated pairs of low volume and high volume samplers and with collocated low and high volume samplers. A discussion and analysis of collocated monitoring data is included in the following section. Results obtained at hot spots with the high volume systems were consistently higher than the corresponding low volume values. The difference in inlet heights of the low and high volume samplers is a contributing factor to the difference in concentrations measured by the two methods.

In general, the procedures and equipment used for the PCB monitoring performed very satisfactorily and based on the QC/QA data presented in the following section appear to have provided high quality results. Data recovery for measurements made with the low volume sampling systems was 95 percent and for the high volume sampler measurements the data recovery was 76 percent. Data loss with the high volume sampling systems was due primarily to failure of high volume sampler motors and the motor generator units. Replacement of the motor in the high volume sampler with a by-pass type would significantly increase the reliability of the high volume sampling system.

Weather during the entire period that the PCB monitoring was performed was unseasonably warm and dry. Daily high temperatures during the sampling at Neal's Landfill and Neal's Dump on June 29 and 30 were about 32 C (90 F). During the period July 12 through 21, high temperatures on days that sampling was performed were at or in excess of 38 C (100 F). There was no rainfall on any sampling day nor very little precipitation during the interim periods. The results obtained from this study probably represents "upper limit" estimates of the airborne PCB levels.

SECTION 6

QUALITY ASSURANCE DATA SUMMARY

Quality control and quality assurance procedures were implemented in this study in accordance with a formal plan approved by the Quality Assurance Division (QAD), EPA/RTP(10). The QC/QA procedures were designed to provide quality control of all steps in the PCB measurements and to permit quantitative assessment of data quality. The QC/QA data obtained during the study are summarized in the following sections.

FLOW CALIBRATIONS

Low Volume Sampling Pumps

The Du Pont P-4000A sampling pumps were calibrated with a Du Pont calibrator system. The calibrator system consists of a 500 cc bubble tube and a Magnehelic flow meter to measure flow rate and a Magnehelic pressure gauge and a needle valve to introduce a flow resistance to check the constant flow performance of the pumps.

Calibration of the pumps was performed twice each sampling day: in the morning before the start of the sampling period and in the evening after termination of sampling. During the morning calibration, the pumps were also checked to determine that the battery was fully charged, that constant flow was maintained at a 254 mm Hg pressure drop and that the low flow indicator functioned properly.

The flow calibration data obtained during the study are presented in Appendix D. The differences between the pre- and post-sampling flow calibrations ranged from +1.9 to -7.9 percent. Generally, flows measured after sampling were slightly less than those determined before sampling due possibly to discharge of the batteries during sampling. With the exception of three occasions, all the pre- and post-sampling flow calibrations (118 determinations) agreed to within ± 5 percent.

High Volume Samplers

Calibration of the EPA high volume samplers was performed after each two days of field sampling. The calibration procedure consisted of a single point comparison of flows measured by an audit venturi attached to the sampler inlet and by the internal venturi in the sampler. Agreement between the two devices, both of which were calibrated by EPA prior to the study, confirmed that the internal venturi provided an accurate measure of the sampler flow rate.

Calibration data for the high volume samplers is given in Appendix D. Differences in flow rates measured with audit and internal venturi devices ranged from approximately +8 to -7 percent, however, about 90 percent of the measurements agreed to within ± 5 percent. One sampler (S/N 6302) gave an unacceptable flow calibration check on July 1. Subsequently, it was found that the internal venturi was blocked with a piece of Teflon tape. Data obtained with this unit on June 29 and 30 was flagged as questionable due to an uncertainty in the sampler flow rate.

FLOW AUDIT

A flow audit of the samplers used in the study was performed by W. F. Barnard, QAD/EPA/RTP. The audit was conducted on June 30 during actual field sampling operations at Neal's Landfill and Neal's Dump. A copy of the report which describes the audit procedures and results is provided in Appendix E. Based on a pre- and post-sampling audit of 20 Du Pont pumps (40 audit flow checks), the average difference between the operator and audit flow rate values was -2.8 percent. The average difference between the BCL and audit flow rates obtained from the audit of seven high volume samplers (nine audit flow checks) was +5.2 percent. It was concluded in the audit report that both types of samplers "showed individual as well as average percent differences well below the 10 percent limit set by QAD as a maximum allowable error".

FIELD BLANKS

Field blanks were analyzed with the ambient air samples collected at each landfill site. The blanks, which were low volume and high volume PUF cartridges carried throughout all field operations except sampling, were grouped with actual samples as shown in Table 5. As shown in the table, the PCB level in all the field blanks was below a minimum detectable concentration of 0.02 μg Aroclor 1242.

STANDARDS ANALYSIS

Three sets of samples consisting of PUF cartridges spiked with known quantities of Aroclor 1242 were analyzed during the study. The samples were prepared by Battelle Columbus Laboratories and submitted to SwRI for analysis along with the ambient air samples. Each set of standards contained six clean, unused PUF cartridges (three low volume and three high volume) spiked with either 1.2, 6.0, or 12.0 μg of Aroclor 1242. National Bureau of Standards/Standard Reference Material (NBS/SRM) 1581 (Aroclor 1242 in transformer oil) was used to prepare the standards.

The results obtained from analysis of the standards are presented in Table 6. Recoveries determined for individual samples ranged from 58 to 142 percent. Variations in recovery do not appear to be correlated with either cartridge type (low volume or high volume) or concentration over the spiking

TABLE 5. FIELD BLANK ANALYSIS DATA

Site(s)	Date	Cartridge[(a)] Type	Quantity PCB[(b)] in Cartridge, µg
Neal's Landfill/ Neal's Dump	6/29/83	LV	<0.02
		HV	<0.02
Neal's Landfill/ Neal's Dump	6/30/83	LV	<0.02
		HV	<0.02
Neal's Landfill/ Neal's Dump	7/12/83	LV	<0.02
		HV	<0.02
Neal's Landfill/ Neal's Dump	7/14/83	LV	<0.02
		HV	<0.02
Lemon Lane Landfill	7/17/83	LV	<0.02
		HV	<0.02
Lemon Lane Landfill	7/20/83	LV	<0.02
		HV	<0.02

(a) LV - Low volume PUF cartridge.
HV - High volume PUF cartridge.

(b) Reported as Aroclor 1242. Less than (<) indicates PCBs were not detected; estimated minimum detectable concentration is given.

TABLE 6. STANDARDS ANALYSIS DATA

Sample No.	Cartridge Type	Aroclor 1242 Added, µg	Aroclor 1242 Found, µg	Recovery, %
06248-LV-1(a)	LV	12.0	8.9	74
-LV-2	LV	6.0	3.7	62
-LV-3	LV	1.2	1.0	83
-HV-1	HV	12.0	9.8	82
-HV-2	HV	6.0	3.5	58
-HV-3	HV	1.2	1.1	92
070883-LV-6(b)	LV	12.0	10.0	83
-LV-4	LV	6.0	6.2	103
-LV-1	LV	1.2	1.3	108
-HV-6	HV	12.0	11.0	92
-HV-5	HV	6.0	5.7	95
-HV-1	HV	1.2	1.0	83
070883-LV-2(c)	LV	12.0	11.0	92
-LV-3	LV	6.0	6.8	113
-LV-5	LV	1.2	1.7	142
-HV-4	HV	12.0	11.0	92
-HV-2	HV	6.0	4.8	80
-HV-3	HV	1.2	1.1	92
Averages of three sets of standards	LV	12.0	--	83
	LV	6.0	--	93
	LV	1.2	--	111
	HV	12.0	--	89
	HV	6.0	--	78
	HV	1.2	--	89
Overall Median	LV	--	--	93
Overall Median	HV	--	--	89

a) Submitted with June 29 and 30 samples from Neal's Landfill and Neal's Dump.

b) Submitted with July 12 and 14 samples from Neal's Landfill and Neal's Dump.

c) Submitted with July 18-21 samples from Lemon Lane Landfill.

range (1.2-12 µg). The median recovery from all the low volume cartridges and all the high volume cartridges was 93 and 89 percent, respectively.

PUF cartridges spiked by SwRI were also analyzed with the ambient air samples. One unused PUF cartridge spiked with 1 µg of Aroclor 1242 was analyzed with each batch of 20 samples. The SwRI spike recovery data are given in Table 7.

COLLOCATED MONITORING DATA

During the field study, pairs of low volume (LV) and high volume (HV) samplers were operated for the same time period at the same sampling location to estimate the reproducibility of the measurement methods. Measurements were also made with collocated low volume and high volume samplers to compare results obtained by the two methods.

The data obtained from collocated low volume samplers is shown in Table 8. Good agreement between the pairs of measurements was obtained. The average difference calculated from all the paired measurements is 11.2 percent. Excluding the high value obtained on June 30, the average difference is 7.2 percent.

PCB concentrations measured by collocated high volume samplers are given in Table 9. The median difference calculated from all the paired high volume sampler measurements is 14 percent. The collocated samplers used to obtain these data were positioned approximately one meter apart to minimize sampling interaction between the units. Moreover, emanation of the PCBs into the air probably occurs from a very localized area where leaking capacitors are exposed. Therefore, it is highly possible that part of the observed differences in the collocated high volume measurements is due to spatial variations in airborne PCB levels.

The results obtained from collocated low volume/high volume samplers during 8 hour daytime sampling periods are shown in Table 10. The PCB concentrations determined by the high volume method (shown in parenthesis in Table 10) are consistently higher than the low volume sampler measurements. Part of the difference in results obtained by the two methods can be attributed to the relative sampling heights. The inlets of the low volume samplers were 180 cm above ground level while the high volume sampler inlets were 117 cm above the ground. At the hot spots where this collocated sampling was performed, the vertical profile measurements show that the airborne PCB concentration decreases rapidly with increasing height above the exposed capacitors. Based on the vertical profile measurements, PCB levels determined at 120 cm (the HV sampling elevation) were approximately twice the levels measured at 180 cm (the LV sampling elevation). Therefore, correction of data to the same sampling elevation was necessary to make a realistic comparison of the two methods.

High volume sampler data corrected to a sampling height of 180 cm is shown in Table 10. The values were calculated using vertical profile measurements obtained on the same day either at the same sampling location, another location on the landfill or at another landfill, depending on availability of the data. The corrected high volume sampler values (C_{180}), in µg/scm were computed by the following equation:

$$C_{180} = C_{120} \frac{VP_{180}}{VP_{120}}$$

where: C_{120} = Reported PCB concentration measured at 120 cm, µg/scm

VP_{120} and VP_{180} = PCB concentrations (µg/scm) obtained from vertical profile measurements at 120 and 180 cm, respectively.

Comparison of the low volume and corrected high volume PCB measurements shows a median difference of 30.8 percent. Considering the potential sources of difference between the measurements (spatial separation of ~1 m, height correction, etc.), the agreement appears good and indicates that the two methods yield comparable results.

TABLE 7. SWRI RECOVERY DATA

Analysis Date		Spike Recovery,(a) %
7/18/83		94
7/21/83		81
7/25/83		109
7/26/83		113
8/3/83		115
8/8/83		108
8/15/83		101
8/17/83		82
8/19/83		86
8/22/83		87
8/24/83		105
8/26/83		85
	Median	97

a) Quantity spiked on PUF was 1 μg.

TABLE 8. COLLOCATED LOW VOLUME SAMPLER DATA(a)

Site	Sampling Date	Sampling Location	PCB Conc. in Air, µg/scm	Percent Difference in Pair
Neal's Landfill	6/29/83	HS-A	9.4 11	15.7
		HS-C	8.8 8.6	2.3
	6/30/83	HS-A	11 6.8	47.2
	7/12/83	HS-C	11 12	8.7
	7/14/83	HS-A	5.1 5.3	3.8
Neal's Dump	6/30/83	HS-A	7.9 9.1	14.1
	7/12/83	HS-A	18 19	5.4
Lemon Lane Landfill	7/18/83	HS-B	77 72	6.7
	7/20/83	HS-C	6.2 6.0	3.3
	7/21/83	HS-A	85 89	4.6
			Median	6.1

a) Separation between sampling cartridge inlets was approximately 15 cm.

TABLE 9. COLLOCATED HIGH VOLUME SAMPLER DATA(a)

Site	Sampling Date	Sampling Location (Type)	PCB Conc. in Air, µg/scm	Percent Difference in Pair
Neal's Landfill	6/29/83	HS-A (24 hr)	12 14	15.4
	6/30/83	HS-C (24 hr)	11 12	8.7
Neal's Dump	7/12/83	HS-A (8 hr)	37 61	49.0
Lemon Lane Landfill	7/17/83	HS-A (8 hr)	98 89	9.6
		HS-C (8 hr)	30 47	44.2
	7/18/83	HS-C (24 hr)	20 23	14.0
	7/20/83	HS-A (24 hr)	45 45	0.0
			Median	14.0

a) Separation between sampler inlets was approximately 1 meter.

TABLE 10. COLLOCATED LOW VOLUME/HIGH VOLUME SAMPLER DATA

Site	Sampling Date	Sampling Location	Sample Type	PCB Conc.[(a)] in Air, µg/scm	Percent Difference in Pairs
Neal's Landfill	6/29/83	HS-C	LV HV	8.7 7.1 (14)	20.3
	6/30/83	HS-C	LV HV	7.0 6.5 (12)	7.4
	7/12/83	HS-A	LV HV	8.5 11.6 (20)	30.8
	7/14/83	HS-A	LV HV	5.2 9.9 (13)	62.3
Neal's Dump	6/29/83	HS-A	LV HV	11 12.3 (26)	11.2
	6/30/83	HS-A	LV HV	8.5 13.5 (23)	45.5
	7/12/83	HS-A	LV HV	18.5 28 (49)	40.9
Lemon Lane Landfill	7/17/83	HS-C	LV HV	11 21 (39)	62.5
		HS-A	LV HV	40 49 (94)	20.2
				Median	30.8

a) An average value was used when two low volume (LV) or high volume (HV) measurements were performed. Values in parenthesis are measured values at 120 cm above ground level; unenclosed values are corrected to 180 cm above ground level using vertical profile data. The latter values were used to calculate differences in LV/HV pairs.

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APPENDIX A

OPERATING PROCEDURES FOR DU PONT LOW VOLUME AND EPA HIGH VOLUME SAMPLERS

Step-wise procedures used to perform sampling with the Du Pont low volume and EPA high volume sampling systems are given below. The procedures follow the protocol that Lewis, et al(4, 5) have developed for PCB monitoring.

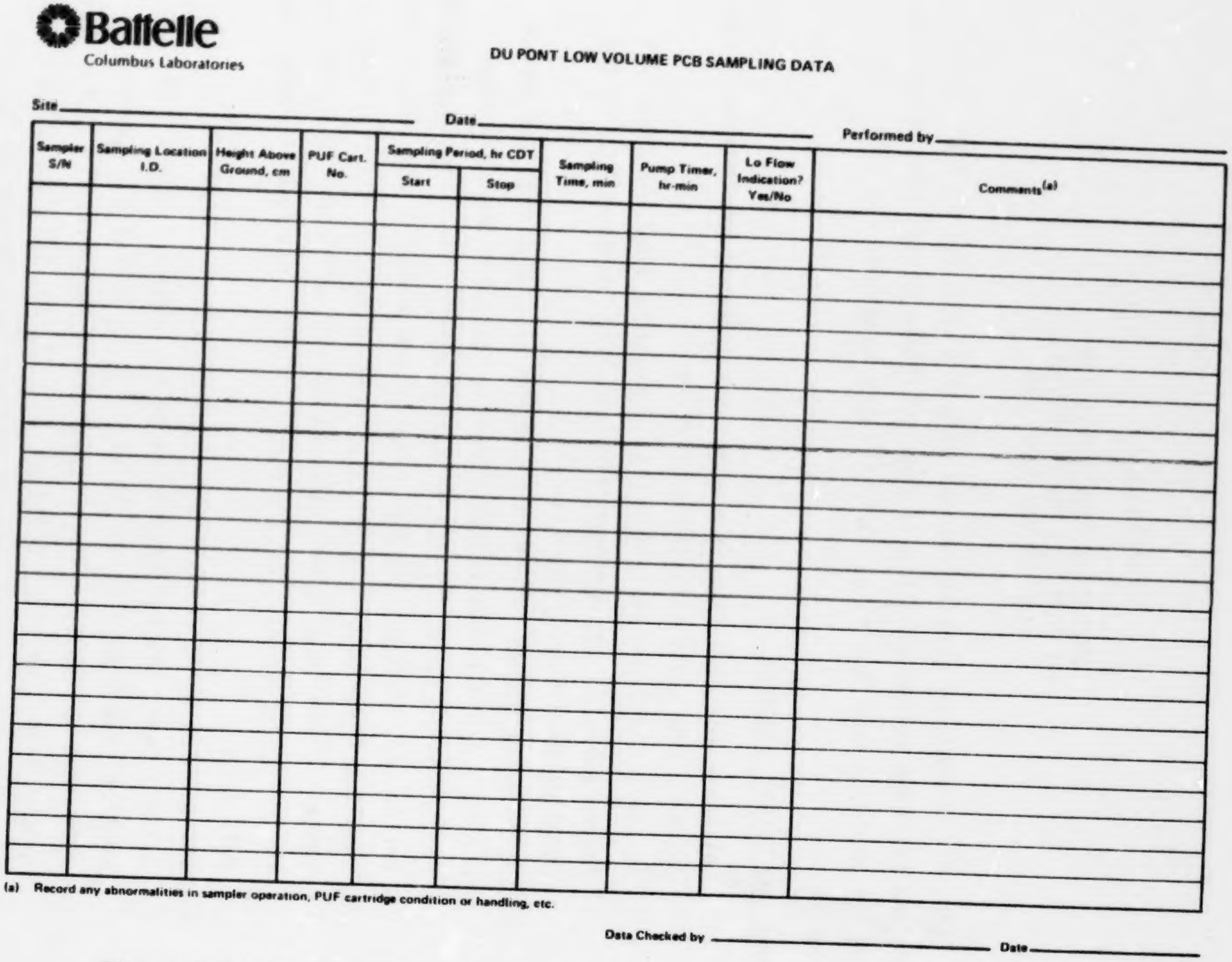
Du Pont Low Volume Samplers

(1) Calibrate the flow rate of the Du Pont pumps in the morning before starting the day's sampling activities.

(2) At the field site, place pumps at designated sampling locations. Record pump S/N and corresponding sampling location I.D. on the Sampling Data Form (Figure A-1).

(3) Using latex gloves, remove a clean PUF cartridge from its sample bottle, carefully unwrap the aluminum foil from the cartridge. Fold aluminum foil, replace in sample bottle, and tightly close the bottle cap. Connect the PUF sampling cartridge to the DuPont pump sampling inlet using a short piece (12-18 in.) of Tygon tubing. (Note: Clean latex gloves _must_ be worn at all times when handling the PUF cartridges). Record the PUF cartridge number on Sampling Data Form.

(4) Using metal three-prong clamps that have been rinsed with B&J hexane, mount the PUF cartridges on the sampler support rod in a vertical position with the inlet pointing downward. Position cartridge inlets as follows: up-wind and "hot-spots" - 1.8 m above ground level, vertical profiles - 2, 30, 60, 120, and 180 cm above ground level. Record cartridge height above ground on Sampling Data Form.



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DU PONT LOW VOLUME PCB SAMPLING DATA

Site ______________________ Date ______________________ Performed by ______________________

Sampler S/N	Sampling Location I.D.	Height Above Ground, cm	PUF Cart. No.	Sampling Period, hr CDT		Sampling Time, min	Pump Timer, hr-min	Lo Flow Indication? Yes/No	Comments[a]
				Start	Stop				

(a) Record any abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by ______________________ Date ______________

Figure A-1. Du Pont low volume PCB sampling data form.

(5) Turn pumps on and begin sampling period at 0900 hrs CDT (±30 minutes). Record starting clock time on Sampling Data Form. During the sampling period check pumps at least every 2 hours for proper operation. Record any abnormal conditions on Sampling Data Form.

(6) After sampling for 8 ±0.5 hrs, terminate sampling period by turning pumps off. Record clock time that pump was turned off on Sampling Data Form. Just before turning pumps off, push test button on pump and check low flow light and the elapsed time indicator lights. If low flow light comes on, it indicates that a low flow condition existed during the sampling period, e.g., Tygon tubing crimped, cartridge plugged, pump stopped, etc). Record results of the low flow check on Sampling Data Form. Record elapsed time from the pump timer on the Sampling Data Form as a check on the clock time.

(7) As soon as possible after termination of sampling, remove the PUF cartridge from the Tygon sample line (using latex gloves), wrap cartridge in its original aluminum foil wrapping, and place in the original sample bottle. Cap tightly, label bottle with sampling data and sample I.D., and seal the bottle cap with a strip of "Evidence Tape".

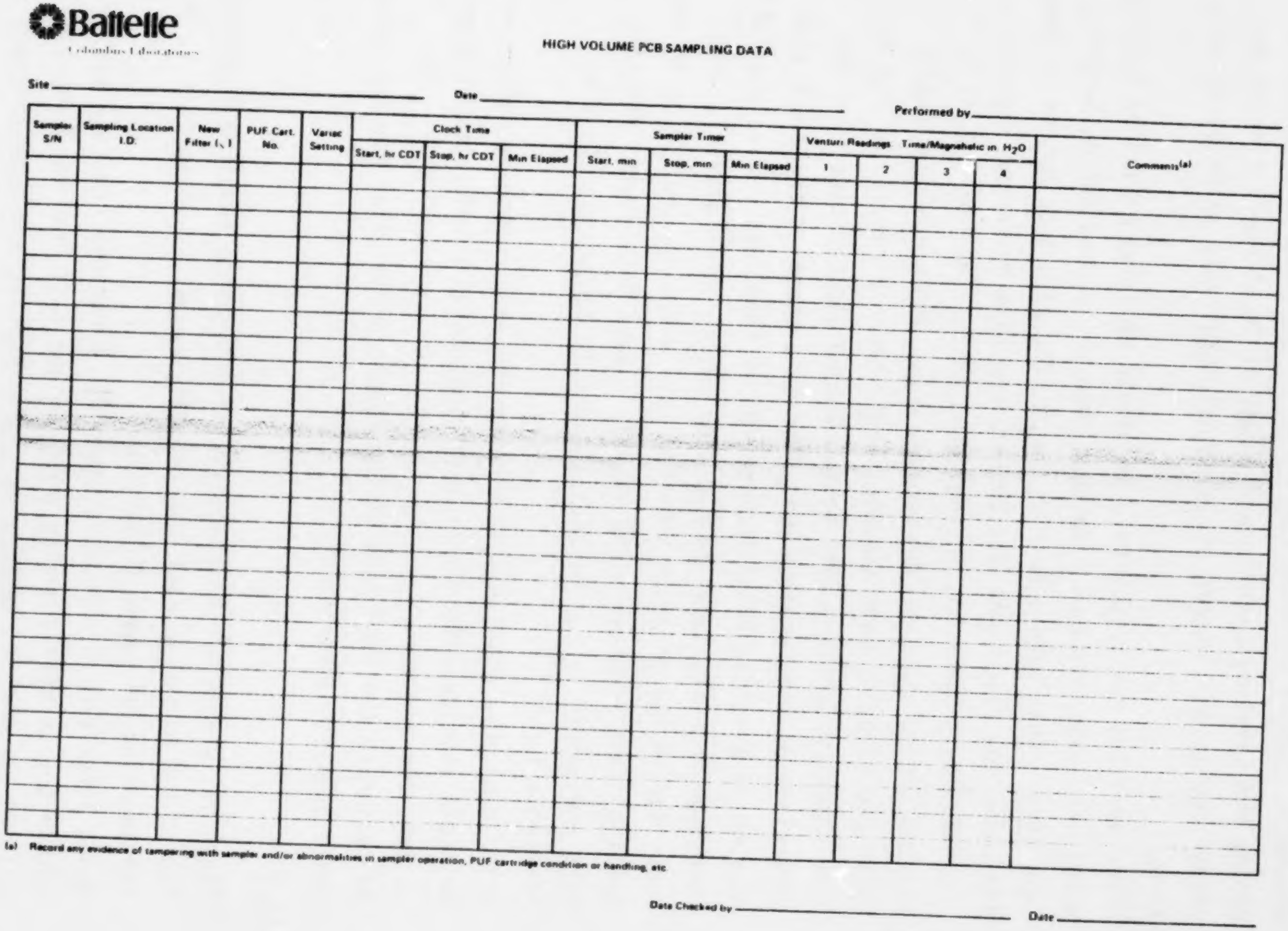
(8) After recovery, store all samples on ice in a locked ice chest. Maintain storage under these conditions until samples are shipped to SwRI for analysis.

(9) Re-calibrate the flow rate of the DuPont pumps after completing the day's sampling activities.

EPA Samplers

(1) Place calibrated EPA hi-vol units at designated sampling locations. Record the hi-vol S/N and corresponding sampling location I.D. on the Sampling Data Form (Figure A-2).

(2) Using latex gloves, remove a clean PUF cartridge from its sample bottle and carefully unwrap the aluminum foil from the cartridge. Fold aluminum foil, replace in sample bottle, and tightly close the bottle cap.



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HIGH VOLUME PCB SAMPLING DATA

Site ______________ Date ______________ Performed by ______________

Sampler S/N	Sampling Location I.D.	New Filter (✓)	PUF Cart. No.	Variac Setting	Clock Time			Sampler Timer			Venturi Readings Time/Magnehelic in H_2O				Comments(a)
					Start, hr CDT	Stop, hr CDT	Min Elapsed	Start, min	Stop, min	Min Elapsed	1	2	3	4	

(a) Record any evidence of tampering with sampler and/or abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by ______________ Date ______________

Figure A-2. High volume PCB sampling data form.

(3) Insert the PUF cartridge into the hi-vol sampler head, making sure that both the top and bottom silicone rubber gaskets are in place. Attach the top section of sampler head and tighten to seal the PUF cartridge in place. Place a new Pallflex 2500 QAST quartz fiber filter in the top of the sampling head and seal in place with the retaining ring. Record PUF cartridge number and indication that new filter was installed on Sampling Data Form.

(4) Turn the hi-vol unit on and begin sampling period at 0800 hrs CDT (±60 minutes) for 24-hour samples. Begin sampling period at 0900 hours CDT (±30 minutes) for units operated concurrently with 8 hour LV samples. Check to ensure that the hi-vol motor exhaust duct is directed downwind. Record starting clock time, elapsed-timer reading and Variac setting on the Sampling Data Form. After the initial 5 minutes of operation, obtain a reading from the Magnehelic gauge and record the clock time and gauge reading on the Sampling Data Form (Space 1).

(5) Monitor sampler for proper operation during the remainder of the daylight hours. Obtain a Magnehelic gauge reading on each hi-volume at approximately 6-hour intervals and record readings and clock times at which the readings were taken on the Sampling Data Form (Spaces 3 and 4).

(6) Before leaving the site in the evening, secure samplers by padlocking access doors on the units.

(7) On the following morning after an elapsed sampling time of 24 ±0.5 hrs, terminate sampling period by turning the hi-vol unit off. Just before turning unit off, obtain a reading from the Magnehelic gauge and record the reading along with the clock time on the Sampling Data Form (Space 4). Record clock time the unit was turned off and the elapsed timer reading on the Sampling Data Form.

(8) As soon as possible after termination of sampling, remove the filter and PUF cartridge from the hi-vol unit sampling head. Using latex gloves, remove the filter retaining ring and with a hexane-rinsed metal spatula remove filter. Fold the filter in half with the face containing the particulate catch inward and then fold in

half again. Completely wrap the filter in a piece of hexane-rinsed aluminum foil and place in the PUF cartridge bottle. Remove the PUF cartridge from sampler head, completely wrap with the original aluminum foil wrapping and place in original sample bottle. Label bottle with sampling data and sample I.D. Cap tightly, label bottle with sampling data, and seal the bottle cap with a strip of "Evidence Tape".

(9) After recovery, store all samples on ice in a locked ice chest. Maintain storage under these conditions until samples are shippped to SwRI for analysis.

APPENDIX B

PCB ANALYSIS PROCEDURE

PUF Cartridge Cleanup

All PUF cartridges were cleaned to remove contamination and interferences prior to use for ambient air monitoring. The clean up was performed by Soxhlet extraction of each PUF plug with 5% ether/hexane for a period of at least 16 hours according to Steps (10) through (16) of the PCB analysis procedure. One PUF plug from each batch of 20 processed through the cleanup steps was re-extracted and analyzed according to the PCB analysis procedure to assure that the plugs are acceptable for field sampling.

Following clean-up, the sampling cartridges (PUF plug in a glass envelope) were wrapped in hexane-rinsed aluminum foil and then individually sealed in cleaned glass bottles (with hexane-rinsed aluminum foil liners in caps) for shipment to the field sampling site.

PCB Analysis Procedure

The PUF cartridges were analyzed for PCB's by a) Soxhlet extraction of the foam plugs as described by Lewis(2), b) concentration of the extract, and c) determination of PCB's by EPA Method 608 (electron capture-gas chromatography). The analyses was performed according to the following procedure.

I. Equipment and Reagents Required for PUF Sample Extraction

1. Glassware

   500 mL boiling flasks
   300 mL capacity Soxhlet extractors
   3 ball condensers
   500 mL Kuderna-Danish apparatus
   15 mL receiver tubes

Synder columns
Filter tubes (Corning 9480-32)
Pre-scored (1 mL, 5mL) amber glass vials with teflon-lined caps
9" long disposable transfer (Pasteur) pipets
Wash all glassware with Alconox; rinse with deionized water, acetone, hexane, and deionized water; then fire in kiln (500 C)

2. Equipment

Extraction Apparatus, Multi-Unit Heater (CMS 119-362)
Blunt-end forceps
Surgical tongs (approximately 12")
Steam bath
Nitrogen blow-down evaporator
Glass wool (Heater overnight at 350 C in muffle furnace)
Boiling granules (Heater overnight at 500 C in kiln)
Teflon wash bottles

3. Reagents

Burdick and Jackson, Distilled in Glass Solvents:
- Acetone
- Hexane
- Ethyl Ether (Preserved with Ethanol)

Sodium Sulfate, 12-60 mesh, Anhydrous (Baker 5-3375) (Heated overnight at 500°C in kiln).

II. Sample Receipt and Extraction

1. Log samples in log book. Note any damage to sample or irregularities (i.e., EPA chain of custody tape broken).
2. Prepare 5% ethyl ether in hexane. Prepare by case lot of hexane. Remove 200 mL of hexane from freshly opened bottle and add 180 mL of freshly opened ethyl ether (preserved with ethanol).
3. Rinse condenser towers with 5% ether/hexane.

4. Wipe off lab bench with 5% ether/hexane.
5. Add 300 mL of 5% ether/hexane to 500 mL boiling flask. Add boiling granules (no more than 3 granules).
6. Dim lights in laboratory before removing first sample. Rinse a large sheet of aluminum foil with 5% ether/hexane. Be sure to use waste rinse container. Place foil, rinsed side up, on lab bench. Use this for forceps and tongs. Rinse forceps and tongs with 5% ether/hexane.
7. Carefully remove sampling cartridge from jar and unwrap aluminum foil. Handle cartridge minimally, placing it on its own aluminum foil wrapping.
8. Note in project log book any breakage or damage to sampling cartridge.
9. With pre-rinsed forceps, carefully remove the foam plug (PUF) from the sampling cartridge.
10. Place the PUF in the Soxhlet, and connect the Soxhlet to the 500 mL boiling flask. (If hi-vol sample, also place corresponding particulate filter in Soxhlet with PUF plug). Wet the joint with 5% ether/hexane. Place the forceps on the aluminum foil wrapping. Label the boiling flask with sample I.D.
11. Taking the pre-rinsed tongs, adjust the PUF in the Soxhlet to wedge it midway along the length of the siphon. Rinse the tongs into the Soxhlet with the 5% ether/hexane. Rinse the forceps, glass sampling cartridge, and aluminum foil wrapping with 5% ether/hexane into the Soxhlet. Place the forceps and tongs on the aluminum foil sheet. Dispose of the aluminum foil wrapping and place the glass cartridge aside for washing and recycling.
12. Connect the Soxhlet to the condenser, wetting the glass joint with 5% ether/hexane for a good seal.
13. Repeat the process for the day's samples being sure to include a solvent blank, field blank, and a control sample.
14. Check water flow to condenser towers, and turn on heating units.

15. As samples begin to boil, check Soxhlets making sure they are filling and siphoning properly (4 cycles/hour). Allow samples to cycle overnight or for a minimum of 16 hours.
16. Turn off heating units and allow samples to cool to room temperature. Be sure the lights are dim.
17. Set up Kuderna-Danish (K-D) with receiver tubes. Add one boiling granule to each set up. Label the K-D's with the sample I.D.
18. Pack filter tubes with glass wool and sodium sulfate. Place tube in neck of K-D.
19. Carefully remove Soxhlet and boiling flask from condenser tower. Drain remaining solvent into boiling flask.
20. Carefully pour sample through filter tube into K-D. Rinse boiling flask 3 times with hexane. Swirling hexane along sides of boiling flask. Once sample has drained, rinse down filter tube with hexane.
21. Attach Snyder column to K-D and rinse Snyder column to wet joint.
22. Place K-D on steam bath and evaporate sample to approximately 5 mL. Do not let sample go to dryness.
23. Remove sample from steam bath, rinsing Snyder column with a minimum of hexane. Allow sample to cool.
24. Remove sample from K-D, making sure to label receiver tube.
25. Rinse nitrogen blow down spouts with hexane and place samples so as to further concentrate. Transfer samples to pre-scored vials using transfer pipets. Rinse receiver tube 3 times making a quantitative transfer. Concentrate samples to 1 mL or per instruction from analyst.
26. Make a master list of all samples prepared, date received, and processed. Give the list and sample extracts to the GC analyst.

III. GC Analysis (EPA Method 608)

1. Analyze samples using the following GC operating conditions.

   Column: Supelcoport 100/120 mesh coated with 1.5% SP-2250/1.95% SP-2401 packed in glass (180 cm x 4 mm ID)

Carrier: 5% methane/95% Argon at 60 mL/min
Column
Temperature: 200 C, isothermal
Detector: ECD

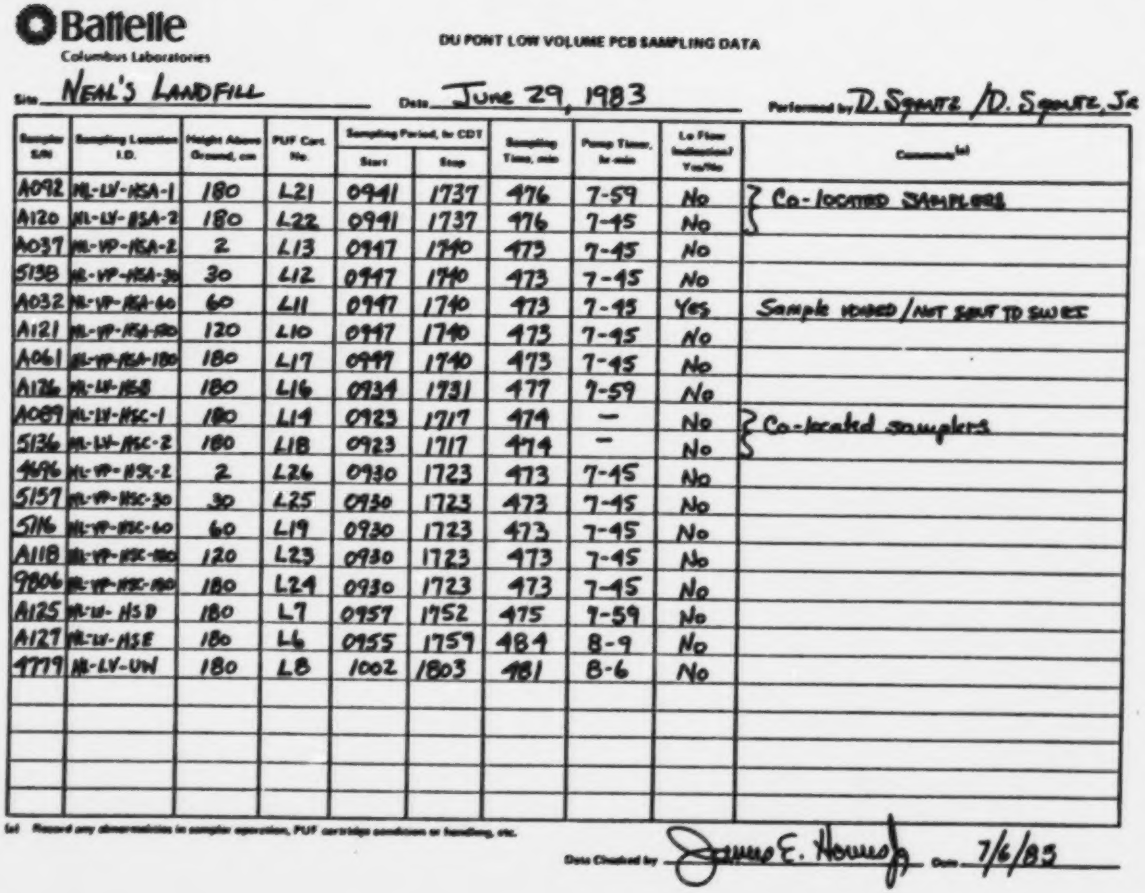
2. Calibrate the system daily with a minimum of three injections of calibration standards which have been referenced to NBS/SRM 1581 (Aroclor 1242 in oils)
3. Inject 2-5 µL of the sample extract using the solvent-flush technique. Smaller (1.0 µL) volumes can be injected if automatic devices are employed. Record the volume injected to the nearest 0.05 µL and the resulting peak size, in area units.
4. If the peak area exceeds the linear range of the system, dilute the extract and reanalyze.

IV. Quality Control (QC)

1. Analyze one laboratory blank per each batch of 20 samples.
2. Analyze one laboratory spike per each batch of 20 samples.

APPENDIX C

FIELD SAMPLING DATA



Battelle
Columbus Laboratories

DU PONT LOW VOLUME PCB SAMPLING DATA

Site NEAL'S LANDFILL Date June 29, 1983 Performed by D. Spurtz /D. Spurtz, Jr

Sampler S/N	Sampling Location I.D.	Height Above Ground, cm	PUF Cart. No.	Sampling Period, hr CDT		Sampling Time, min	Pump Timer, hr-min	Lo Flow Indication? Yes/No	Comments[a]
				Start	Stop				
A092	NL-LV-HSA-1	180	L21	0941	1737	476	7-59	No	Co-located samplers
A120	NL-LV-HSA-2	180	L22	0941	1737	476	7-45	No	
A037	NL-VP-HSA-2	2	L13	0947	1740	473	7-45	No	
5138	NL-VP-HSA-30	30	L12	0947	1740	473	7-45	No	
A032	NL-VP-HSA-60	60	L11	0947	1740	473	7-45	Yes	Sample voided/not sent to SwRI
A121	NL-VP-HSA-120	120	L10	0947	1740	473	7-45	No	
A061	NL-VP-HSA-180	180	L17	0947	1740	473	7-45	No	
A126	NL-LV-HSB	180	L16	0934	1731	477	7-59	No	
A089	NL-LV-HSC-1	180	L14	0923	1717	474	–	No	Co-located samplers
5136	NL-LV-HSC-2	180	L18	0923	1717	474	–	No	
4696	NL-VP-HSC-2	2	L26	0930	1723	473	7-45	No	
5157	NL-VP-HSC-30	30	L25	0930	1723	473	7-45	No	
5116	NL-VP-HSC-60	60	L19	0930	1723	473	7-45	No	
A118	NL-VP-HSC-120	120	L23	0930	1723	473	7-45	No	
9806	NL-VP-HSC-180	180	L24	0930	1723	473	7-45	No	
A125	NL-LV-HSD	180	L7	0957	1752	475	7-59	No	
A127	NL-LV-HSE	180	L6	0955	1759	484	8-9	No	
4779	NL-LV-UW	180	L8	1002	1803	481	8-6	No	

[a] Record any abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by James E. Howes Date 7/6/83

Battelle
Columbus Laboratories

DU PONT LOW VOLUME PCB SAMPLING DATA

Site NEAL'S LANDFILL Date JUNE 30, 1983 Performed by HOWES / D. SQOUTE, JR.

Sampler S/N	Sampling Location I.D.	Height Above Ground, cm	PUF Cart. No.	Sampling Period, hr CDT		Sampling Time, min	Pump Timer, hr-min	Lo Flow Indication? Yes/No	Comments[(a)]
				Start	Stop				
A080	NL-LV-HSA-1	180	L5	0901	1655	474	—	No	} Co-located samplers
A125	NL-LV-HSA-2	180	L9	0901	1655	474	7-45	No	
A037	NL-VP-HSA-2	2	L50	0858	1659	481	8-0	No	
A062	NL-VP-HSA-30	30	L46	0858	1659	481	8-2	No	
A061	NL-VP-HSA-60	60	L42	0858	1659	481	8-3	No	
A126	NL-VP-HSA-120	120	L51	0858	1659	481	8-2	No	
A083	NL-VP-HSA-180	180	L47	0858	1659	481	8-1	No	
5157	NL-LV-HSB	180	L37	0928	1722	474	7-57	No	
A094	NL-LV-HSC	180	L29	0913	1713	480	8-5	No	
A143	NL-VP-HSC-2	2	L28	0910	1708	478	8-0	No	
A087	NL-VP-HSC-30	30	L41	0910	1708	478	8-2	No	
4696	NL-VP-HSC-60	60	L45	0910	1708	478	8-0	No	
4779	NL-VP-HSC-120	120	L15	0910	1708	478	8-3	No	
5939	NL-VP-HSC-180	180	L4	0914	1708	478	7-49	No	
5116	NL-LV-HSD	180	L36	0936	1731	475	7-53	No	
A127	NL-LV-HSE	180	L32	0936	1735	479	8-1	No	
A121	NL-LV-UW	180	L43	0940	1743	483	8-6	No	

(a) Record any abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by James E. Howes Jr. Date 7/6/83

Battelle
Columbus Laboratories

DU PONT LOW VOLUME PCB SAMPLING DATA

Site NEAL'S LANDFILL Date JULY 12, 1983 Performed by D. Sgontz /D. Sgontz, Jr.

Sampler S/N	Sampling Location I.D.	Height Above Ground, cm	PUF Cart. No.	Sampling Period, hr CDT		Sampling Time, min	Pump Timer, hr-min	Lo Flow Indication? Yes/No	Comments[a]
				Start	Stop				
5138	NL-LV-NSA	180	L69	0850	1656	486	8-8	No	
5116	NL-VP-NSA-2	2	L65	0846	1646	480	8-0	No	
4696	NL-VP-NSA-30	30	L74	0847	1648	481	8-9	No	
A083	NL-VP-NSA-60	60	L70	0848	1652	484	8-7	No	
A120	NL-VP-NSA-120	120	L66	0849	1653	484	8-8	No	
A118	NL-VP-NSA-180	180	L65	0850	1655	485	8-6	No	
A094	NL-LV-NSB	180	L71	0900	1710	490	8-5	No	
A126	NL-LV-NSC-1	180	L121	0908	1716	488	8-14	No	} Co-located samplers
A061	NL-LV-NSC-2	180	L67	0908	1716	488	8-13	No	
5157	NL-VP-NSC-2	2	L72	0918	1720	482	8-9	No	
A032	NL-VP-NSC-30	30	L68	0918	1720	482	8-9	No	Hose became disconnected from Cart.
9806	NL-VP-NSC-60	60	L118	0918	1720	482	8-6	No	
A088	NL-VP-NSC-120	120	L123	0918	1720	482	8-7	YES	Low flow @ 1345 hr check
A080	NL-VP-NSC-180	180	L127	0918	1720	482	8-6	YES	Low flow @ 1345 hr check
A143	NL-LV-NSD	180	L117	0928	1738	490	8-14	No	
A089	NL-LV-NSE	180	L122	0932	1742	490	8-15	No	
A121	NL-LV-UW	180	L73	0940	1749	489	8-13	No	

(a) Record any abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by James E. Howes Jr. Date 7/29/83

Battelle
Columbus Laboratories

DU PONT LOW VOLUME PCB SAMPLING DATA

Site NEAL'S LANDFILL Date JULY 14, 1983 Performed by D. Sgontz /Lemmon

Sampler S/N	Sampling Location I.D.	Height Above Ground, cm	PUF Cart. No.	Sampling Period, hr CDT		Sampling Time, min	Pump Timer, hr-min	Lo Flow Indication? Yes/No	Comments[a]
				Start	Stop				
4696	NL-LV-HSA-1	180	L78	0857	1654	477	8-1	No	Co-located samplers
5116	NL-LV-HSA-2	180	L83	0857	1654	477	7-56	No	
A061	NL-VP-HSA-2	2	L125	0907	1707	480	8-1	No	
A037	NL-VP-HSA-30	30	L77	0904	1704	480	8-5	No	
A118	NL-VP-HSA-60	60	L82	0902	1702	480	8-0	No	
A127	NL-VP-HSA-120	120	L86	0900	1701	481	8-4	No	
A038	NL-VP-HSA-180	180	L87	0900	1659	479	8-1	No	
A083	NL-LV-HSB	180	L115	0848	1647	479	8-3	No	
A032	NL-LV-HSC	180	L116	0836	1636	480	8-6	No	
A089	NL-VP-HSC-2	2	L126	0841	1639	478	8-1	No	
5157	NL-VP-HSC-30	30	L76	0841	1639	478	8-2	No	
A121	NL-VP-HSC-60	60	L119	0841	1639	478	8-2	No	
A126	NL-VP-HSC-120	120	L109	0841	1639	478	8-1	No	
A087	NL-VP-HSC-180	180	L64	0841	1639	478	8-2	No	
A062	NL-LV-HSD	180	L88	0923	1720	477	8-0	No	
A125	NL-LV-HSE	180	L89	0927	1723	476	7-56	No	
4789	NL-LV-UW	180	L107	0935	1728	473	7-55	No	

(a) Record any abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by James E. Howes Jr. Date 8/3/83

Battelle
Columbus Laboratories

DU PONT LOW VOLUME PCB SAMPLING DATA

Site Neal's Dump

Date June 30, 1983

Performed by Lemmon / D.L. Sgonte, Jr

Sampler S/N	Sampling Location I.D.	Height Above Ground, cm	PUF Cart. No.	Sampling Period, hr CDT		Sampling Time, min	Pump Timer, hr-min	Lo Flow Indication? Yes/No	Comments[a]
				Start	Stop				
A089	ND-LV-HSA-1	180	L62	0907	1703	476	7-59	No	} Co-located samplers
A118	ND-LV-HSA-2	180	L61	0907	1703	476	7-59	No	
A088	ND-LV-HSB	180	L52	0910	1724	494	8-15	No	
A092	ND-LY-UW	180	L3	0913	1719	486	8-7	No	

(a) Record any abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by James E. Howes Jr Date 7/6/83

Battelle
Columbus Laboratories

DU PONT LOW VOLUME PCB SAMPLING DATA

Site NEAL'S DUMP

Date JUNE 29, 1983

Performed by Howes /Lemmon

Sampler S/N	Sampling Location I.D.	Height Above Ground, cm	PUF Cart. No.	Sampling Period, hr CDT		Sampling Time, min	Pump Timer, hr-min	Lo Flow Indication? Yes/No	Comments[a]
				Start	Stop				
A079	ND-LV-UW	180	L57	0830	1658	508	8-31	No	
A087	ND-LV-HSA	180	L56	0902	1706	484	7-54	No	
A083	ND-LV-HSB	180	L53	0907	1701	474	7-52	No	

(a) Record any abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by James E. Howes Jr. Date 7/6/83

Battelle
Columbus Laboratories

DU PONT LOW VOLUME PCB SAMPLING DATA

Site NEAL'S DUMP Date JULY 12, 1983 Performed by LEMMON

Sampler S/N	Sampling Location I.D.	Height Above Ground, cm	PUF Cart. No.	Sampling Period, hr CDT		Sampling Time, min	Pump Timer, hr-min	Lo Flow Indication? Yes/No	Comments[a]
				Start	Stop				
4789	ND-LV-HSA-1	180	L38	0927	1720	473	7-58	No	Co-located samplers
5939	ND-LV-HSA-2	180	L33	0927	1720	473	7-57	No	
A062	ND-LV-HSB	180	L34	0933	1733	480	8-7	No	
A092	ND-LV-UW	180	L30	0935	1728	473	7-59	No	

(a) Record any abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by James E. Howes Jr Date 7/29/83

Battelle
Columbus Laboratories

DU PONT LOW VOLUME PCB SAMPLING DATA

Site LEMON LANE LANDFILL Date JULY 17, 1983 Performed by D. SQOUTZ / J. HOWES

Sampler S/N	Sampling Location I.D.	Height Above Ground, cm	PUF Cart. No.	Sampling Period, hr CDT		Sampling Time, min	Pump Timer, hr-min	Lo Flow Indication? Yes/No	Comments[a]
				Start	Stop				
A127	LL-LV-HSA-1	180	L114	0851	1700	489	8-14	No	} Co-located samplers
A094	LL-LV-HSA-2	180	L104	0851	1700	489	8-14	Yes	Calibration OK in PM
A121	LL-LV-HSB	180	L79	0851	1700	489	8-14	No	
9806	LL-LV-HSC	180	L90	0845	1700	495	8-11	No	
5136	LL-VP-HSC-2	2	L91	0845	1700	495	8-9	No	
5116	LL-VP-HSC-30	30	L95	0845	1700	495	8-10	No	
A062	LL-VP-HSC-60	60	L99	0845	1700	495	8-12	No	
5157	LL-VP-HSC-120	120	L98	0845	1700	495	8-12	No	
A037	LL-VP-HSC-180	180	L94	0845	1700	495	8-10	No	
A061	LL-LV-UW	180	L54	0751	1739	588	9-48	No	

(a) Record any abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by James E. Howes Jr Date 8/3/83

Battelle
Columbus Laboratories

DU PONT LOW VOLUME PCB SAMPLING DATA

Site LEMON LANE LANDFILL Date JULY 18, 1983 Performed by D. SQOUTZ, JR / HOWES

Sampler S/N	Sampling Location I.D.	Height Above Ground, cm	PUF Cart. No.	Sampling Period, hr CDT		Sampling Time, min	Pump Timer, hr min	Lo Flow Indication? Yes/No	Comments[(a)]
				Start	Stop				
A126	LL-LV-HSA	180	L151	0852	1700	488	8-13	No	
5138	LL-LV-HSB-1	180	L150	0852	1700	488	8-11	No	} Co-located samplers
A120	LL-LV-HSB-2	180	L149	0852	1700	488	8-11	No	
4779	LL-LV-HSC	180	L97	0902	1700	478	8-2	No	
A089	LL-VP-HSC-2	2	L93	0902	1700	478	8-0	No	
A118	LL-VP-HSC-30	30	L85	0902	1700	478	8-0	No	
4696	LL-VP-HSC-60	60	L102	0902	1700	478	8-0	No	
A032	LL-VP-HSC-120	120	L92	0902	1700	478	8-2	No	
A092	LL-VP-HSC-180	180	L81	0902	1700	478	8-0	No	
A143	LL-LV-UW	180	L55	0845	1719	514	8-39	No	

(a) Record any abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by James E. Howes Jr Date 8/3/83

Battelle
Columbus Laboratories

DU PONT LOW VOLUME PCB SAMPLING DATA

Site LEMON LANE LANDFILL   Date JULY 20, 1983   Performed by D. SGOUTZ JR / HOWES

Sampler S/N	Sampling Location I.D.	Height Above Ground, cm	PUF Cart. No.	Sampling Period, hr CDT		Sampling Time, min	Pump Timer, hr-min	Lo Flow Indication? Yes/No	Comments[a]
				Start	Stop				
4696	LL-LV-HSA	180	L148	0902	1708	486	8-23	No	
A089	LL-LV-HSB	180	L147	0904	1709	485	8-8	No	
A087	LL-LV-HSC-1	180	L152	0855	1655	480	8-4	No	Co-located samples
A118	LL-LV-HSC-2	180	L145	0855	1655	480	8-4	No	
A121	LL-VP-HSC-2	2	L144	0855	1655	480	8-4	No	
A062	LL-VP-HSC-30	30	L143	0855	1655	480	8-6	No	
A094	LL-VP-HSC-60	60	L141	0855	–	–	–	YES	PUMP STOPPED @ 1055 HRS ; SAMPLE VOID
A032	LL-VP-HSC-120	120	L96	0855	–	–	–	YES	PUMP STOPPED @ 1440 HRS ; SAMPLE VOID
A083	LL-VP-HSC-180	180	L101	0855	1655	480	8-1	No	
A143	LL-LV-UW	180	L169	0845	1657	492	8-17	No	

[a] Record any abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by James E. Howes   Date 8/3/83

Battelle
Columbus Laboratories

DU PONT LOW VOLUME PCB SAMPLING DATA

Site LEMON LANE LANDFILL

Date JULY 21, 1983

Performed by D. SGONTZ, JR / HOWES

Sampler S/N	Sampling Location I.D.	Height Above Ground, cm	PUF Cart. No.	Sampling Period, hr CDT		Sampling Time, min	Pump Timer, hr-min	Lo Flow Indication? Yes/No	Comments[a]
				Start	Stop				
A038	LL-LV-HSA-1	180	L170	0901	1705	484	8-3	No	
A126	LL-LV-HSA-2	180	L166	0901	1705	484	8-2	No	
9806	LL-LV-HSB	180	L168	0901	1705	484	8-6	No	
5157	LL-LV-HSC	180	L134	0855	1655	480	8-8	No	
5116	LL-VP-HSC-2	2	L138	0855	1655	480	7-58	No	
A092	LL-VP-HSC-30	30	L135	0855	1655	480	8-6	No	
A120	LL-VP-HSC-60	60	L139	0855	1655	480	8-6	No	
A125	LL-VP-HSC-120	120	L130	0855	1655	480	8-3	No	
5136	LL-VP-HSC-180	180	L131	0855	1655	480	8-4	No	
A061	LL-LV-UW	180	L167	0845	1700	495	8-15	No	

(a) Record any abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by James E. Howes Jr Date 8/3/83

Battelle
Columbus Laboratories

HIGH VOLUME PCB SAMPLING DATA

Site NEAL'S LANDFILL

Date 6/29/83

Performed by D. Sgontz / D. Sgontz, Jr

Sampler S/N	Sampling Location I.D.	New Filter (✓)	PUF Cart No.	Variac Setting	Clock Time			Sampler Timer			Venturi Readings Time/Magnehelic in. H_2O				Comments[(a)]
					Start, hr CDT	Stop, hr CDT	Min Elapsed	Start, min	Stop ~~Start~~, min	Min Elapsed	1	2	3	4	
EPA-13	NL-HV-UW	✓		110	0820 (6/29)	0801 (6/30)	1421	77037	78460	1423	40	40	—	42	
EPA-15	NL-HV-DW1	✓	H25	110	0832	1655	503	61788	62299	511	41	40.5	40	40	
EPA-90	NL-HV-DW2	✓	H24	110	0837 (6/29)	0828 (6/30)	1431	501	1947	1446	39	38.5	38.5	38	
0001	NL-HV-DW3	✓	H16	110	0851 (6/29)	0955 (6/30)	1504	50415	52006	1591	41	40.5	40	40	
EPA-92	NL-HV-DW4	✓	H11	110	0857 (6/29)	0953 (6/30)	1496	59168	60704	1536	42	42	43	42	
EPA-1	NL-HV-HSA-1	✓	H21	110	0841 (6/29)	0839 (6/30)	1438	10410	11830	1420	28	28	28.5	28	
NEW-2	NL-HV-HSA-2	✓	H22	110	0844 (6/29)	0839 (6/30)	1435	11595	13013	1418	41	40	41	41	
EPA-93	NL-HV-HSC	✓	H10	110	0913	1711	478	14314	14791	477	41	41	42	41	

(a) Record any evidence of tampering with sampler and/or abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by Todd E. Lemmon Date 7/6/83

Battelle
Columbus Laboratories

HIGH VOLUME PCB SAMPLING DATA

Site NEAL'S LANDFILL Date 6/30/83 Performed by Howes / Sgontz ,

Sampler S/N	Sampling Location I.D.	New Filter (√)	PUF Cart. No.	Varian Setting	Clock Time			Sampler Timer			Venturi Readings: Time/Magnehelic in. H_2O				Comments[a]
					Start, hr CDT	Stop, hr CDT	Min Elapsed	Start, min	Stop, min	Min Elapsed	1	2	3	Final	
EPA-13	NL-HV-UW	✓	H 30	110	0807	—	—	78466	78581	115	40				78581 min. - Power off @ Residenc
					(6/30)										
EPA-15	NL-HV-DW1	✓	H27	110	0838	1650	492	62314	62821	507	41	41		40	
												(1149)			
EPA-90	NL-HV-DW2	✓	H37	110	0849	0849	1440	1953	3403	1450	39	39		39	
					(6/30)	(7/1)						(1150)			
0801	NL-HV-DW3	✓	H71	110	1010	1008	1438	52010	53485	1475	41	41		40	
					(6/30)	(7/1)									
EPA-92	NL-HV-DW4	✓	H72	110	1005	1605	1440	60708	62157	1449	42	42		40	
					(6/30)	(7/1)									
EPA-1	NL-HV-HSA-1	✓	H33	110	0949	—	—	11837	13078	1241	28	28			}
					(6/30)	—									} Both off at 0820
HEW-2	NL-HV-HSA-2	✓	H36	110	0948	—	—	13018	14258	1240	41	41			} 7/1/83
					(6/30)	—									0610 #2 will not work
EPA-93	NL-HV-HSC	✓	H34	110	0942	1713	451	14798	15270	472	41	41		41	

(a) Record any evidence of tampering with sampler and/or abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by Todd F. Lemmon Date 7/6/83

Battelle
Columbus Laboratories

HIGH VOLUME PCB SAMPLING DATA

Site NEAL'S LANDFILL Date 7/12/83 Performed by D. Sgontz

Sampler S/N	Sampling Location I.D.	New Filter (✓)	PUF Cart. No.	Variac Setting	Clock Time			Sampler Timer			Venturi Readings: Time/Magnehelic in. H_2O				Comments(a)
					Start, hr CDT	Stop, hr CDT	Min Elapsed	Start, min	Stop, min	Min Elapsed	1	2	3	4	
EPA-90	NL-HV-DW2	✓	H78	110	0750 (7/12)	0750 (7/13)	1440	3413	4868	1455	39	39	39	40	
0001	NL-HV-DW3	✓	H77	110	0800 (7/12)	0800 (7/13)	1440	53491	54937	1446	41	41	41	41	
EPA-92	NL-HV-DW4	✓	H83	110	0807 (7/12)	0807 (7/13)	1440	62165	63650	1485	42	42	42	44	
EPA-93	NL-HV-HSC-1	✓	H82	110	0816 (7/12)	0816 (7/13)	1440	15286	16685	1399	41	41	41	42	
EPA-94	NL-HV-HSC-2	✓	H86	110	0816 (7/12)	— —	—	32067	—	—	39	38	38	–	Not running @0814; sample voided
EPA-1	NL-HV-HSA	✓	H81	110	0852 (7/12)	1701 (7/12)	489	13094	13608	514	28	28	28	–	
EPA-15	NL-HV-DW1	✓	H79	110	0855 (7/12)	1707 (7/12)	492	62836	63328	492	41	39 (1008)	38	37	

(a) Record any evidence of tampering with sampler and/or abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by Todd F. Lemmon Date 8/3/83

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HIGH VOLUME PCB SAMPLING DATA

Site NEAL'S LANDFILL Date 7/14/83 Performed by Sgontz / Lemmon

Sampler S/N	Sampling Location I.D.	New Filter (✓)	PUF Cart. No.	Variac Setting	Clock Time			Sampler Timer			Venturi Readings: Time/Magnehelic in. H_2O				Comments[a]
					Start, hr CDT	Stop, hr CDT	Min Elapsed	Start, min	Stop, min	Min Elapsed	1	2	3	4	
0002	NL-HV-UW	✓	H5	110	0758 (7/14)	0747 (7/15)	1429	21763	23210	1447	46	46	46	46	
EPA-90	NL-HV-DW2	✓	H3	110	0806 (7/14)	0755 (7/15)	1429	4868	6282	1414	39	39	38	39	
EPA-11	NL-HV-DW3	✓	H9	110	0812 (7/14)	— —	—	54937	—	—	41	39	—	—	
EPA-92	NL-HV-DW4	✓	H106	110	0817 (7/14)	0759 (7/15)	1422	63650	65113	1463	42	39	39	39	
EPA-93	NL-HV-HSC-1	✓	H29	110	0834 (7/14)	— —	—	16685	17161	476	41	40	40	—	Off at 1630; voided
EPA-13	NL-HV-HSC-2	✓	H85	110	0834 (7/14)	— —	—	79055	—	—	40	40	—	—	Failed ; sample voided
EPA-1	NL-HV-HSA	✓	H7	110	0853 (7/14)	1651 (7/14)	478	13609	14111	502	28	28	28	—	
EPA-15	NL-HV-DW1	✓	H64	110	0917 (7/14)	1715 (7/14)	478	63328	63807	479	41	37	37	—	

(a) Record any evidence of tampering with sampler and/or abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by Todd F. Lemmon Date 8/3/83

Battelle
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HIGH VOLUME PCB SAMPLING DATA

Site NEAL'S DUMP Date 6/29/83 Performed by Howes / Lemmon

Sampler S/N	Sampling Location I.D.	New Filter (✓)	PUF Cart. No.	Variac Setting	Clock Time			Sampler Timer			Venturi Readings: Time/Magnehelic in. H2O				Comments(a)
					Start, hr CDT	Stop, hr CDT	Min Elapsed	Start, min	Stop, min	Min Elapsed	1	2	3	4	
EPA-95	ND-HV-UW	✓	H76	110	0825	0826	1441	19402	20841	1439	42	43	42	42	Final 49
					(6/29)	(6/30)					(0825)	(1100)	(1415)	(1715)	(0826)
0002	ND-HV-DW	✓	H75	110	0841	0842	1441	16259	17697	1438	46	44	41	43	47
					(6/29)	(6/30)					(0841)	(1100)	(1415)	(1715)	(0842)
6302	ND-HV-HSA	✓	H74	110	0859	1706	487	34403	34903	500	34	33	33		
											(0859)	(1100)	(1415)		Refueled 1100, 1430

(a) Record any evidence of tampering with sampler and/or abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by Todd F. Lemmon Date 7/6/83

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HIGH VOLUME PCB SAMPLING DATA

Site NEAL'S DUMP

Date 6/30/83

Performed by Lemmon / Sgontz, Jr.

Sampler S/N	Sampling Location I.D.	New Filter (✓)	PUF Cart. No.	Venturi Setting	Clock Time			Sampler Timer			Venturi Readings: Time/Magnehelic in. H_2O				Comments[a]
					Start, hr CDT	Stop, hr CDT	Min Elapsed	Start, min	Stop, min	Min Elapsed	1	2	3	4	Final
EPA-95	ND-HV-UW	✓	H68	110	0838	0824	1426	20853	22278	1425	42	42	41	40	62
					(6/30)	(7/1)					(0838)	(1200)	(1445)	(1717)	
0002	ND-HV-DW	✓	H69	110	0850	0830	1420	17705	19116	1411	46	45	46	45	46
					(6/30)	(7/1)					(0850)	(1200)	(1445)	(1730)	Motor changed - 1430
6302	ND-HV-HSA	✓	H70	110	0906	1710	484	34903	35396	493	34	35	34	32	
											(0906)	(1200)	(1445)	(1710)	Refueled 1200, 1415

(a) Record any evidence of tampering with sampler and/or abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by Todd F. Lemmon Date 7/6/83

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HIGH VOLUME PCB SAMPLING DATA

Site NEAL'S DUMP

Date 7/12/83

Performed by Lemmon

Sampler S/N	Sampling Location I.D.	New Filter (✓)	PUF Cart. No.	Variac Setting	Clock Time			Sampler Timer			Venturi Readings: Time/Magnehelic in. H_2O				Comments[(a)]
					Start, hr CDT	Stop, hr CDT	Min Elapsed	Start, min	Stop, min	Min Elapsed	1	2	3	Final	
0002	ND-HV-DW	✓	H92	110	0815 (7/12)	0800 (7/13)	1425	20248	21671	1423	46 (0815)	44 (1215)	46 (1708)	48 (0800)	
EPA-95	ND-HV-UW	✓	H91	110	0823 (7/12)	0805 (7/13)	1422	23423	24843	1420	42 (0823)	43 (1220)	40 (1710)	45 (0805)	
10484	ND-HV-HSA-1	✓	H95	110	0915 (7/12)	1715 (7/12)	480	-	-	-	46 (0915)	49 (1215)	48 (1400)	49 (1715)	Timer broken
EPA-13	ND-HV-HSA-2	✓	H90	110	0915 (7/12)	1745 (7/12)	510*	78586	79051	465	40 (0915)	37 (1220)	38 (1400)	45 (1745)	*Off for 45 min. 1130-1215 Sampling time - 465 min

(a) Record any evidence of tampering with sampler and/or abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by Todd F. Lemmon Date 8/3/83

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Columbus Laboratories

HIGH VOLUME PCB SAMPLING DATA

Site LEMON LANE LANDFILL Date 7/17/83 Performed by Sgontz / Howes

Sampler S/N	Sampling Location I.D.	New Filter (√)	PUF Cart. No.	Variac Setting	Clock Time			Sampler Timer			Venturi Readings: Time/Magnehelic in. H_2O				Comments[a]
					Start, hr CDT	Stop, hr CDT	Min Elapsed	Start, min	Stop, min	Min Elapsed	1	2	3	4	
EPA 93	LL-HV-8-HSA1	✓	H51	110	0800	1700	540	17166	17674	508	41	41	41	41	
					(7/17)	(7/17)					(0856)	(1240)	(1536)	(1700)	
EPA-90	LL-HV-8-HSA-2	✓	H50	110	0800	1700	540	6295	6856	561	39	39	39	39	Co-located Samplers
					(7/17)	(7/17)					(0856)	(1240)	(1536)	(1700)	
EPA-15	LL-HV-24-HSA	✓	H49	110	0808	—	—	63814	65042	1228	41	40.5	41	—	Motor gen. stopped;
					(7/17)	—					(0856)	(1240)	(1700)	—	sample voided
0002	LL-HV-8-HSC	✓	H47	110	0829	1700	511	23224	23673	449	46	46	46	46	
					(7/17)	(7/17)					(0837)	(1217)	(1530)	(1700)	
EPA 92	LL-HV-24-HSC	✓	H48	110	0829	~0715	—	65121	—	—	42	41	41	—	Sampler failed;
					(7/17)	(7/18)					(0837)	(1216)	(1730)	—	sample voided
10484	LL-HV-DW1	✓	H94	110	0728	0746	1458	80749	82202	1453	53	49	48	50	
					(7/17)	(7/18)					(0733)	(0900)	(1209)	(0746)	
EPA-94	LL-HV-DW2	✓	H96	110	0717	0732	1455	34677	36125	1448	39	38	40	40	
					(7/17)	(7/18)					(0722)	(1200)	(1757)	(0732)	
EPA-95	LL-HV-UW	✓	H102	110	0744	0802	1458	27251	28706	1455	42	42	42	44	
					(7/17)	(7/18)					(0750)	(1405)	(1806)	(0802)	
1000	LL-HV-24-HSC	✓	H46	—	0835	1738	543	27	563	536	40	40	40	40	
					(7/17)	(7/17)					(0839)	(1215)	(1730)	(1730)	

[a] Record any evidence of tampering with sampler and/or abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by Todd H. Lemmon Date 8/3/83

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HIGH VOLUME PCB SAMPLING DATA

Site LEMON LANE LANDFILL　Date 7/18/83　Performed by Sgontz/Howes

Sampler S/N	Sampling Location I.D.	New Filter (√)	PUF Cart. No.	Variac Setting	Clock Time			Sampler Timer			Venturi Readings: Time/Magnehelic in. H_2O				Comments[a]
					Start, hr CDT	Stop, hr CDT	Min Elapsed	Start, min	Stop, min	Min Elapsed	1	2	3	4	
EPA-15	LL-HV-24-HSA1	✓	H155	110	0838	0830	1432	65046	66472	1426	41	40	41	41	
					(7/18)	(7/19)					(0923)	(1327)	(1630)	(0830)	Co-located samplers
EPA-93	LL-HV-24-HSA-2	✓	H158	110	0846	—	—	17674	18248	574	41	41	41	—	Motor gen. Stopped;
					(7/18)	—					(0923)	(1328)	(1630)	—	Sample voided
0002	LL-HV-24-HSC	✓	H159	110	0913	0910	1437	23676	25138	1462	46	45	46	46	
					(7/18)	(7/19)					(0915)	(1335)	(1645)	(0910)	Co-located samplers
1000	LL-HV-24-HSC	✓	H161	—	0913	0910	1437	562	1958	1396	40	40	40	40	
					(7/18)	(7/19)					(0915)	(1335)	(1645)	(0910)	
10484	LL-HV-DW1	✓	H93	110	0752	0748	1436	82208	83646	1438	52	50	50	51	
					(7/18)	(7/19)					(0757)	(1349)	(1700)	(0748)	
EPA-94	LL-HV-DW2	✓	H99	110	0739	0739	1440	36133	37100	967	39	37	38	41	HV unplugged;
					(7/18)	(7/19)					(0745)	(1345)	(1700)	(0739)	Sample voided
EPA-95	LL-HV-UW	✓	H98	110	0810	0800	1430	28713	30145	1432	42	41	42	41	
					(7/18)	(7/19)					(0815)	(1200)	(1721)	(0800)	

(a) Record any evidence of tampering with sampler and/or abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by Todd F. Lemmon　Date 8/3/83

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HIGH VOLUME PCB SAMPLING DATA

Site LEMON LANE LANDFILL Date 7/20/83 Performed by Sgontz/Howes

Sampler S/N	Sampling Location I.D.	New Filter (✓)	PUF Cart. No.	Venturi Setting	Clock Time			Sampler Timer			Venturi Readings: Time/Magnehelic in. H_2O				Comments[a]
					Start, hr CDT	Stop, hr CDT	Min Elapsed	Start, min	Stop, min	Min Elapsed	1	2	3	4	
EPA-93	LL-HV-24-HSA-1	✓	H53	110	0810 (7/20)	0810 (7/21)	1440	18275	19734	1459	41 (0815)	41 (1200)	41 (1712)	43 (0810)	Co-located samplers
1000	LL-HV-24-HSA-2	✓	H65	–	0810 (7/20)	0810 (7/21)	1440	1968	3442	1474	56 (0815)	56 (1200)	56 (1712)	57 (0810)	
0002	LL-HV-24-HSC-1	✓	H52	110	0832 (7/20)	0832 (7/21)	1440	25155	26583	1428	46 (0837)	46 (1215)	46 (1700)	46 (0832)	Co-located SAMPLERS
EPA-92	LL-HV-24-HSC-2	✓	H54	110	0832 (7/20)	— —	—	66529	67207	678	42 (0837)	41 (1215)	42 (1700)	— —	Motor gen. Stopped; sample voided
10484	LL-HV-DW1	✓	H59	110	0754 (7/20)	0729 (7/21)	1415	85092	86508	1416	48 (0754)	46 (1158)	45 (1645)	50 (0729)	
EPA-94	LL-HV-DW2	✓	H58	110	0741 (7/20)	0718 (7/21)	1417	38542	39932	1390	39 (0741)	37 (1156)	35 (1647)	41 (0718)	Power off shortly overnight
EPA-95	LL-HV-UW	✓	H44	110	0811 (7/20)	0747 (7/21)	1416	31597	33014	1417	42 (0811)	40 (1148)	40 (1702)	42 (0747)	

[a] Record any evidence of tampering with sampler and/or abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by: Todd G. Lemmon Date 8/3/83

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HIGH VOLUME PCB SAMPLING DATA

Site LEMON LANE LANDFILL Date 7/21/83 Performed by Sgontz/Howes

Sampler S/N	Sampling Location I.D.	New Filter (√)	PUF Cart. No.	Varian Setting	Clock Time			Sampler Timer			Venturi Readings: Time/Magnehelic in. H_2O				Comments[a]
					Start, hr CDT	Stop, hr CDT	Min Elapsed	Start, min	Stop, min	Min Elapsed	1	2	3	4	
EPA-93	LL-HV-24-HSA-1	✓	H45	110	0903	–	–	19734	20395	661	41	41	41	–	Motor gen. Stopped;
					(7/21)	–					(0908)	(1309)	(1702)	–	sample voided
1000	LL-HV-24-HSA-2	✓	H160	–	0903	–	–	3442	4235	793	56	52	56	–	Motor gen. Stopped;
					(7/21)	–					(0908)	(1309)	(1702)	–	sample voided
0002	LL-HV-HSC-1	✓	H162	110	0845	0840	1435	26583	27991	1408	46	46	45	46	
					(7/21)	(7/22)					(0850)	(1305)	(1645)	(0840)	
EPA-92	LL-HV-HSC-2	✓	H157	110	0845	–	–	67276	67910	634	42	42	42	–	Motor gen. Stopped;
					(7/21)	–					(0850)	(1305)	(1645)	–	sample voided
10484	LL-HV-DW1	✓	H57	110	0735	0806	1471	86515	87987	1472	50	48	50	50	
					(7/21)	(7/22)					(0740)	(1231)	(1648)	(0806)	
EPA-94	LL-HV-DW2	✓	H43	110	0725	0757	1472	39938	41408	1470	39	39	38	41	
					(7/21)	(7/22)					(0730)	(1238)	(1650)	(0757)	
EPA-95	LL-HV-UW	✓	H39	110	0752	–	–	33019	–	–	42	42	42	–	Motor out overnight;
					(7/21)	–					(0757)	(1226)	(1700)	–	sample voided

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[a] Record any evidence of tampering with sampler and/or abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by Todd F. Lemmon Date 8/3/83

APPENDIX D

FLOW CALIBRATION DATA

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DUPONT SAMPLING PUMP FLOW CALIBRATION

Performed by Sgontz/Lemmon Calibrator S/N ________ Amb. Temp. AM 21° PM 23° °C

Date/Time 6/29/83 AM 0635 PM 1030 Stop Watch S/N ________ Bar. Press. AM 742 PM 739.5 mm Hg

Flow Corr. Factor* AM 0.9647 PM 0.9524

Pump S/N	EPA No.	Battery ok? (Yes/No)	Low Flow Check ok? (Yes/No)	Calibration Data								Avg. Flow from Pre- & Post Sampling Calibration, scc/min
				Bubble Meter, sec/400 cc, 0" Hg				Flow Meter Rdg, ℓ/m		Bubble Meter Flow		
				1	2	3	Avg	0" Hg	10" Hg	cc/min	scc/min**	
A079	174621	yes	yes	6.35	6.37	6.37	6.36	3.82	3.82	3774	3641	(-1.9%)
"	"			6.38	6.41	6.42	6.40	3.75	3.72	3750	3571	3606
A087	174615	yes	yes	6.36	6.30	6.39	6.35	3.80	3.80	3780	3647	(-1.8%)
"	"			6.38	6.36	6.40	6.38	3.80	3.79	3762	3583	3615
A083	174625	yes	yes	6.32	6.26	6.32	6.30	3.85	3.85	3803	3669	(-1.3%)
"	"			6.28	6.30	6.31	6.30	3.80	3.80	3803	3622	3646

*Correction to 25 C, 760 mm Hg (see tables).
**scc/min = cc/min x correction factor.

Data Check by/Date Todd H. Lemmon 7/6/83
Form DSPC 012183

Battelle
Columbus Laboratories

DUPONT SAMPLING PUMP FLOW CALIBRATION

Performed by Sgontz/Lemmon Calibrator S/N ______ Amb. Temp. AM 23 PM 24 °C

Date/Time 6/30/83 / AM 0630 PM 1610 Stop Watch S/N ______ Bar. Press. AM 743 PM 743 mm Hg

Flow Corr. Factor* AM 0.9540 PM 0.94[illegible]

Pump S/N	EPA No.	Battery ok? (Yes/No)	Low Flow Check ok? (Yes/No)	Calibration Data								Avg. Flow from Pre- & Post Sampling Calibration, scc/min
				Bubble Meter, sec/400 cc, 0" Hg				Flow Meter Rdg, ℓ/m		Bubble Meter Flow		
				1	2	3	Avg	0" Hg	10" Hg	cc/min	scc/min**	
A089	174633	yes	yes	6.08	6.09	6.06	6.08	3.90	3.90	3947	3765	(-1.0%)
"	"			6.09	6.10	6.13	6.11	3.93	3.91	3928	3727	3746
A118	174611	yes	yes	6.17	6.15	6.09	6.14	3.85	3.85	3909	3729	(-2.9%)
"	"			6.28	6.28	6.30	6.29	3.89	3.89	3816	3621	3675
A088	174634	yes	yes	6.51	6.53	6.53	6.52	3.70	3.70	3681	3492	(-0.3%)
"	"			6.51	6.57	6.54	6.54	3.72	3.72	3670	3482	3487
A092	174620	yes	yes	6.10	6.14	6.12	6.12	3.82	3.82	3922	3742	(-0.9%)
"	"			6.13	6.14	6.16	6.14	3.91	3.91	3909	3709	3726

*Correction to 25 C, 760 mm Hg (see tables).

**scc/min = cc/min x correction factor.

Data Check by/Date Todd M. Lemmon 7/6/83

Form DSPC-012183

Battelle
Columbus Laboratories

DUPONT SAMPLING PUMP FLOW CALIBRATION

Performed by Howes/Lemmon/Sgontz Calibrator S/N ______ Amb. Temp. AM 21 °C PM 23 °C
Date/Time 6/29/83 AM 0620 PM 1035 Stop Watch S/N ______ Bar. Press. AM 742 PM 739.5 mm Hg
Flow Corr. Factor* AM 0.9647 PM 0.9524

Pump S/N	EPA No.	Battery ok? (Yes/No)	Low Flow Check ok? (Yes/No)	Calibration Data								Avg. Flow from Pre- & Post Sampling Calibration, scc/min
				Bubble Meter, sec/400 cc, 0" Hg				Flow Meter Rdg, ℓ/m		Bubble Meter Flow		
				1	2	3	Avg	0" Hg	10" Hg	cc/min	scc/min**	
A089	174633	yes	yes	6.38	6.37	6.38	6.38	3.80	3.80	3762	3629	(-2.9%)
"	"			6.46	6.52	6.50	6.49	3.72	3.72	3698	3522	3576
5136	176798	yes	yes	6.24	6.22	6.26	6.24	3.90	3.90	3846	3710	(-2.4%)
"	"			6.29	6.30	6.35	6.31	3.85	3.85	3803	3622	3666
4696	176817	yes	yes	6.33	6.30	6.26	6.29	3.83	3.83	3816	3681	(-3.0%)
"	"			6.39	6.38	6.44	6.40	3.78	3.78	3750	3572	3626
5157	176787	yes	yes	6.24	6.25	6.25	6.25	3.85	3.85	3840	3704	(-3.9%)
"	"			6.46	6.41	6.40	6.42	3.80	3.80	3738	3560	3632
5116	176819	yes	yes	6.31	6.34	6.32	6.32	3.85	3.85	3797	3663	(-3.6%)
"	"			6.44	6.48	6.49	6.47	3.78	3.75	3709	3532	3598
A118	174611	yes	yes	6.30	6.33	6.38	6.34	3.82	3.82	3785	3651	(-2.5%)
"	"			6.43	6.40	6.44	6.42	3.77	3.77	3738	3560	3606
9806	174626	yes	yes	6.32	6.27	6.31	6.30	3.85	3.85	3803	3669	(-0.2%)
"	"			6.22	6.24	6.27	6.24	3.87	3.87	3846	3663	3666
A126	174616	yes	yes	6.35	6.34	6.35	6.35	3.75	3.74	3780	3647	(-4.2%)
"	"			6.52	6.53	6.58	6.54	3.72	3.72	3670	3495	3571
A092	174620	yes	yes	6.42	6.38	6.42	6.40	3.80	3.80	3750	3618	(-3.3%)
"	"			6.52	6.54	6.53	6.53	3.72	3.72	3675	3500	3559
A120	174612	yes	yes	6.31	6.33	6.35	6.33	3.80	3.80	3791	3657	(-5.9%)
"	"			6.63	6.62	6.66	6.64	3.62	3.62	3614	3442	3550
A037	174624	yes	yes	6.19	6.22	6.17	6.19	3.82	3.82	3877	3740	(-3.2%)
"	"			6.32	6.30	6.32	6.31	3.82	3.82	3803	3622	3681

*Correction to 25 C, 760 mm Hg (see tables).
**scc/min = cc/min x correction factor.

Data Check by/Date Todd M. Lemmon 7/7/83
Form DSPC-012183

Battelle
Columbus Laboratories

DUPONT SAMPLING PUMP FLOW CALIBRATION

Performed by Howes/Lemmon/Szantz Calibrator S/N ________ Amb. Temp. AM 21 °C PM 23 °C
Date/Time 6/29/83 AM 0630 PM 1835 Stop Watch S/N ________ Bar. Press. AM 742 PM 739.5 mm Hg

Flow Corr. Factor* AM 0.9647 PM 0.9524

Pump S/N	EPA No.	Battery ok? (Yes/No)	Low Flow Check ok? (Yes/No)	Calibration Data								Avg. Flow from Pre- & Post Sampling Calibration, scc/min
				Bubble Meter, sec/400 cc, 0" Hg				Flow Meter Rdg, ℓ/m		Bubble Meter Flow		
				1	2	3	Avg	0" Hg	10" Hg	cc/min	scc/min**	
5138	176801	yes	yes	6.33	6.33	6.35	6.34	3.75	3.75	3785	3651	(-4.6%)
"	"			6.54	6.57	6.57	6.56	3.70	3.70-4.0	3659	3484	3568
A032	174630	yes	yes	6.29	6.29	6.32	6.30	3.79	3.79	3809	3675	
"	"			—	—	—	—	—	—	—	—	Won't run - LF
A121	174618	yes	yes	6.20	6.20	6.19	6.20	3.84	3.83	3870	3773	(-3.8%)
"	"			6.30	6.29	6.30	6.30	3.85	3.85	3810	3628	3700
A061	174628	yes	yes	6.28	6.28	6.31	6.30	3.78	3.76	3809	3675	(-4.6%)
"	"			6.55	6.50	6.50	6.52	3.70	3.70	3681	3506	3590
A127	174622	yes	yes	6.37	6.37	6.38	6.37	3.72	3.71	3768	3635	(-4.2%)
"	"			6.59	6.51	6.58	6.56	3.70	3.70	3659	3484	3560
A125	174619	yes	yes	6.39	6.38	6.36	6.37	3.80	3.80	3768	3635	(-2.4%)
"	"			6.43	6.43	6.46	6.44	3.85	3.85	3727	3549	3592
4779	176781	yes	yes	6.38	6.42	6.35	6.38	3.80	3.80	3762	3629	(-2.5%)
"	"			6.46	6.45	6.48	6.46	3.78	3.78	3715	3538	3584

*Correction to 25 C, 760 mm Hg (see tables).
**scc/min = cc/min x correction factor.

Data Check by/Date Todd M. Lemmon 7/7/83
Form DSPC-012183

Battelle
Columbus Laboratories

DUPONT SAMPLING PUMP FLOW CALIBRATION

Performed by Sgontz / Lemmon Calibrator S/N ______ Amb. Temp. AM 23°C PM 24° °C Flow Corr. Factor* AM 0.954 PM 0.9408

Date/Time 6/30/83 AM 0630 PM 1810 Stop Watch S/N ______ Bar. Press. AM 741 PM 741 mm Hg

Pump S/N	EPA No.	Battery ok? (Yes/No)	Low Flow Check ok? (Yes/No)	Calibration Data								Avg. Flow from Pre- & Post Sampling Calibration, scc/min
				Bubble Meter, sec/400 cc, O" Hg				Flow Meter Rdg, ℓ/m		Bubble Meter Flow		
				1	2	3	Avg	O" Hg	10" Hg	cc/min	scc/min**	
4779	176781	yes	yes	6.10	6.13	6.16	6.11	3.85	3.82	3928	3747	(-2.0%)
"	"			6.21	6.15	6.24	6.20	3.85	3.82	3871	3673	3710
5939	176816	yes	yes	6.25	6.28	6.26	6.26	3.85	3.85	3834	3658	
"	"			6.—	6.—	6.—	6.—	—	—	—	—	Would not calibrate
A094	174623	yes	yes	6.34	6.34	6.37	6.35	3.75	3.75	3780	3606	(-2.6%)
"	"			6.49	6.48	6.47	6.48	3.70	3.70	3704	3514	3560
5157	176787	yes	yes	6.07	6.12	6.06	6.08	3.82	3.82	3947	3765	(-3.1%)
"	"			6.23	6.26	6.22	6.24	3.82	3.82	3846	3649	3707
5116	176819	yes	yes	6.07	6.08	6.01	6.05	3.97	3.97	3967	3785	(-0.2%)
"	"			6.04	6.03	6.03	6.03	3.95	3.92	3980	3776	3780
A127	174622	yes	yes	6.14	6.12	6.14	6.13	3.78	3.78	~~395~~ 3945	3735	(-2.8%)
"	"			6.27	6.28	6.26	6.27	3.82	3.82	~~3915~~ 3828	3632	3684

*Correction to 25 C, 760 mm Hg (see tables).
**scc/min = cc/min x correction factor.

Data Check by/Date Todd M. Lemmon 7/7/83
Form DSPC-012183

Battelle
Columbus Laboratories

DUPONT SAMPLING PUMP FLOW CALIBRATION

Performed by Sgontz/Lemmon Calibrator S/N ______ Amb. Temp. AM 23°C PM 24 °C

Date/Time 6/30/83 AM 0630 PM 1010 Stop Watch S/N ______ Bar. Press. AM 741 PM 741 mm Hg

Flow Corr. Factor* AM 0.954 PM 0.9408

Pump S/N	EPA No.	Battery ok? (Yes/No)	Low Flow Check ok? (Yes/No)	Calibration Date								Avg. Flow from Pre- & Post Sampling Calibration, scc/min
				Bubble Meter, sec/400 cc, 0" Hg				Flow Meter Rdg, ℓ/m		Bubble Meter Flow		
				1	2	3	Avg	0" Hg	10" Hg	cc/min	scc/min**	
A121	174618	yes	yes	6.20	6.18	6.17	6.18	3.75	3.75	3883	3704	(+0.1%)
"	"			6.19	6.14	6.10	6.14	3.90	3.90	3909	3709	3706
A037	174624	yes	yes	6.09	6.08	6.12	6.10	3.80	3.80	3934	3753	(+0.5%)
"	"			6.02	6.06	6.05	6.04	3.95	3.95	3974	3770	3762
A062	174632	yes	yes	6.13	6.14	6.07	6.11	3.82	3.82	3928	3747	(-0.5%)
"	"			6.11	6.10	6.13	6.11	3.72	3.70	3928	3727	3737
A061	174628	yes	yes	6.24	6.20	6.18	6.21	3.85	3.85	3865	3687	(-1.5%)
"	"			6.27	6.24	6.29	6.27	3.70	3.70	3828	3632	3660
A126	174616	yes	yes	6.36	6.39	6.40	6.38	3.71	3.71	3762	3589	(-2.1%)
"	"			6.48	6.49	6.48	6.48	3.60	3.59	3704	3514	3552
A083	174625	yes	yes	6.30	6.35	6.35	6.33	3.80	3.80	3791	3617	(-2.2%)
"	"			6.42	6.44	6.45	6.44	3.72	3.72	3727	3536	3576
A080	174629	yes	yes	6.09	6.11	6.13	6.11	3.80	3.80	3928	3747	(-2.8%)
"	"			6.19	6.27	6.29	6.25	3.82	3.82	3840	3643	3695
A125	174619	yes	yes	6.13	6.13	6.13	6.13	3.78	3.75	3915	3735	(-1.2%)
"	"			6.16	6.19	6.16	6.17	3.90	3.90	3890	3691	3713
A143	174613	yes	yes	6.37	6.42	6.42	6.40	3.78	3.37	3750	3578	(-1.0%)
"	"			6.42	6.43	6.44	6.43	3.74	3.74	3732	3541	3560
A087	174615	yes	yes	6.40	6.37	6.45	6.41	3.79	3.79	3744	3572	(+0.4%)
"	"			6.33	6.37	6.35	6.35	3.80	3.79	3780	3586	3579
A696	176817	yes	yes	6.12	6.07	6.12	6.10	3.82	3.80	3934	3753	(-1.87%)
"	"			6.17	6.19	6.18	6.18	3.91	3.90	3883	3684	3718

*Correction to 25 C, 760 mm Hg (see tables).
**scc/min = cc/min x correction factor.

Data Check by/Date Todd F. Lemmon 7/7/83
Form DSPC 012183

Battelle
Columbus Laboratories

DUPONT SAMPLING PUMP FLOW CALIBRATION

Performed by Lemmon/Sgontz, Jr. Calibrator S/N ____________ Amb. Temp. AM 25 °C PM 24 °C Flow Corr. Factor* AM 0.9451 PM 0.9488

Date/Time 7/12/83 AM 0630 PM 1845 Stop Watch S/N ____________ Bar. Press. AM 742 PM 741 mm Hg

Pump S/N	EPA No.	Battery ok? (Yes/No)	Low Flow Check ok? (Yes/No)	Calibration Data								Avg. Flow from Pre- & Post Sampling Calibration, scc/min
				Bubble Meter, sec/400 cc, 0" Hg				Flow Meter Rdg, ℓ/m		Bubble Meter Flow		
				1	2	3	Avg	0" Hg	10" Hg	cc/min	scc/min**	
A092	174620	yes	yes	6.11	6.09	6.08	6.09	3.94	3.96	3941	3725	(-2.3%)
				6.26	6.25	6.28	6.26	3.83	3.83	3834	3638	3682
5939	176816	yes	yes	6.29	6.29	6.24	6.27	3.92	3.92	3828	3618	(-4.1%)
				6.55	6.55	6.59	6.56	3.69	3.69	3658	3471	3544
A062	174632	yes	yes	6.13	6.11	6.10	6.11	3.92	3.92	3928	3712	(-3.7%)
				6.39	6.38	6.34	6.37	3.79	3.79	3768	3575	3644
4789	176765	yes	yes	6.20	6.24	6.26	6.23	3.82	3.81	3852	3641	(-2.9%)
				6.42	6.43	6.46	6.44	3.73	3.72	3727	3536	3588
5116	176819	yes	yes	6.24	6.25	6.22	6.24	3.90	3.89	3846	3635	(-4.2%)
				6.52	6.54	6.55	6.54	3.69	3.69	3670	3482	3558
5136	176798	yes	yes	6.12	6.18	6.14	6.15	3.99	3.99	3902	3688	(-1.5%)
				6.26	6.27	6.29	6.27	3.84	3.83	3828	3632	3660
A087	174615	yes	yes	6.30	6.30	6.27	6.29	3.81	3.80	3816	3606	(-3.0%)
				6.50	6.51	6.51	6.51	3.73	3.73	3687	3498	3552
A089	174633	yes	yes	6.02	6.04	6.06	6.04	3.97	3.97	3974	3756	(-1.3%)
				6.11	6.17	6.15	6.14	3.92	3.92	3909	3709	3732
A088	174634	yes	yes	6.25	6.30	6.31	6.29	3.81	3.81	3816	3606	(-2.2%)
				6.44	6.42	6.51	6.46	3.72	3.72	3715	3525	3565
A032	174630	yes	yes	6.31	6.34	6.30	6.32	3.82	3.82	3797	3589	(-1.5%)
				6.41	6.48	6.44	6.44	3.77	3.77	3727	3536	3562
A143	174613	yes	yes	6.33	6.34	6.39	6.35	3.79	3.79	3780	3572	(-1.0%)
				6.48	6.41	6.43	6.44	3.72	3.72	3727	3536	3554

*Correction to 25 C, 760 mm Hg (see tables).
**scc/min = cc/min x correction factor.

Data Check by/Date: Todd Fr. Lemmon 8/2/83
Form DSPC 012183

Battelle
Columbus Laboratories

DUPONT SAMPLING PUMP FLOW CALIBRATION

Performed by Lemmon/Sgontz, Jr. Calibrator S/N ______ Amb. Temp. AM 25 °C PM 24 °C

Date/Time 7/12/83 AM 0630 PM 1835 Stop Watch S/N ______ Bar. Press. AM 742 PM 741 mm Hg

Flow Corr. Factor* AM 0.9451 PM 0.9488

Pump S/N	EPA No.	Battery ok? (Yes/No)	Low Flow Check ok? (Yes/No)	Calibration Data								Avg. Flow from Pre- & Post Sampling Calibration, scc/min
				Bubble Meter, sec/400 cc, 0" Hg				Flow Meter Rdg, ℓ/m		Bubble Meter Flow		
				1	2	3	Avg	0" Hg	10" Hg	cc/min	scc/min**	
9806	174626	yes	yes	6.15	6.18	6.13	6.15	3.90	3.90	3902	3688	(+0.2%)
				6.10	6.17	6.22	6.16	3.90	3.90	3896	3697	3692
A080	174629	yes	yes	6.08	6.11	6.11	6.10	3.94	3.94	3934	3718	(-0.9%)
				6.21	6.17	6.16	6.18	3.88	3.88	3883	3685	3702
5157	176787	yes	yes	6.08	6.01	6.03	6.04	3.97	3.97	3974	3755	(-3.9%)
				6.37	6.28	6.28	6.31	3.82	3.60	3803	3609	3682
A061	174628	yes	yes	6.19	6.20	6.23	6.21	3.89	3.89	3865	3653	(-0.6%)
				6.28	6.25	6.28	6.27	3.82	3.82	3828	3632	3642
A126	174616	yes	yes	6.39	6.42	6.42	6.41	3.72	3.72	3744	3538	(-1.0%)
				6.50	6.52	6.48	6.50	3.68	3.68	3692	3503	3521
A094	174623	yes	yes	6.34	6.36	6.36	6.35	3.80	3.80	3780	3572	(-1.2%)
				6.38	6.47	6.50	6.45	3.70	3.70	3721	3530	3551
4779	176781	yes	yes	6.38	6.38	6.42	6.39	3.77	3.77	3756	3550	(-1.5%)
				6.58	6.50	6.45	6.51	3.65	3.65	3687	3498	3524
5138	176801	yes	yes	6.20	6.21	6.22	6.21	3.89	3.89	3865	3653	(-1.4%)
				6.33	6.27	6.37	6.32	3.80	3.80	3797	3603	3628
A120	174612	yes	yes	6.34	6.33	6.33	6.33	3.79	3.79	3791	3583	(-1.2%)
				6.46	6.43	6.40	6.43	3.73	3.73	3732	3541	3583
A083	174625	yes	yes	6.29	6.28	6.24	6.27	3.83	3.82	3828	3618	(-0.4%)
				6.36	6.30	6.31	6.32	3.77	3.77	3797	3603	3611
4696	176817	yes	yes	6.19	6.21	6.26	6.22	3.90	3.90	3858	3647	(-0.2%)
				6.25	6.26	6.26	6.26	3.80	3.80	3834	3638	3642

*Correction to 25 C, 760 mm Hg (see tables).
**scc/min = cc/min x correction factor.

Data Check by/Date Todd Jr. Lemmon 8/2/83
Form DSPC-012183

Battelle
Columbus Laboratories

DUPONT SAMPLING PUMP FLOW CALIBRATION

Performed by Lemmon / Sgontz Calibrator S/N ____________ Amb. Temp. AM 25°C PM 24 °C Flow Corr. Factor* AM 0.9451

Date/Time 7/12/83 AM 0830 PM 1935 Stop Watch S/N ____________ Bar. Press. AM 742 PM 741 mm Hg PM 0.9488

Pump S/N	EPA No.	Battery ok? (Yes/No)	Low Flow Check ok? (Yes/No)	Calibration Data								Avg. Flow from Pre- & Post Sampling Calibration, scc/min
				Bubble Meter, sec/400 cc, 0" Hg				Flow Meter Rdg, ℓ/m		Bubble Meter Flow		
				1	2	3	Avg	0" Hg	10" Hg	cc/min	scc/min**	
A037	174624	yes	yes	6.34	6.30	6.33	6.32	3.80	3.80	3797	3589	(+0.1%)
				6.35	6.35	6.31	6.34	3.78	3.78	3785	3592	3591
A125	174619	yes	yes	6.34	6.30	6.34	6.33	3.80	3.80	3791	3583	(+0.1%)
				6.38	6.35	6.33	6.35	3.78	3.78	3780	3586	3584
A118	174611	yes	yes	6.15	6.18	6.21	6.18	3.91	3.91	3883	3670	(+0.2%)
				6.20	6.19	6.18	6.19	3.90	3.90	3877	3679	3674
A121	174618	yes	yes	6.39	6.42	6.37	6.39	3.79	3.79	3756	3550	(-0.1%)
				6.39	6.41	6.46	6.42	3.80	3.81	3738	3547	3548

*Correction to 25 C, 760 mm Hg (see tables).

**scc/min = cc/min x correction factor.

Data Check by/Date Todd H. Lemmon 8/2/83

Form DSPC-012183

Battelle
Columbus Laboratories

DUPONT SAMPLING PUMP FLOW CALIBRATION

Performed by Lemmon /Sgontz Calibrator S/N ______ Amb. Temp. AM 26 PM 23 °C

Date/Time 7/14/83 AM 0630 PM 1830 Stop Watch S/N ______ Bar. Press. AM 767 PM 765 mm Hg

Flow Corr. Factor* AM 0.9726 PM 0.9855

Pump S/N	EPA No.	Battery ok? (Yes/No)	Low Flow Check ok? (Yes/No)	Calibration Data								Avg. Flow from Pre- & Post Sampling Calibration, scc/min
				Bubble Meter, sec/400 cc, 0" Hg				Flow Meter Rdg, ℓ/m		Bubble Meter Flow		
				1	2	3	Avg	0" Hg	10" Hg	cc/min	scc/min**	
A062	174632	yes	yes	6.27	6.26	6.31	6.28	3.89	3.89	3822	3718	(-2.9%)
				6.50	6.60	6.55	6.55	3.65	3.65	3664	3611	3665
A061	174628	yes	yes	6.18	6.22	6.22	6.21	3.90	3.90	3865	3760	(-0.8%)
				6.41	6.30	6.30	6.34	3.75	3.75	3785	3730	3745
5116	176819	yes	yes	6.30	6.29	6.30	6.30	3.82	3.81	3810	3706	(-1.8%)
				6.45	6.55	6.51	6.50	3.68	3.68	3692	3638	3672
A121	174618	yes	yes	6.33	6.33	6.34	6.33	3.81	3.81	3791	3688	(-1.6%)
				6.50	6.54	6.51	6.52	3.65	3.65	3681	3628	3658
A118	174611	yes	yes	6.18	6.17	6.15	6.17	3.89	3.89	3890	3784	(-2.9%)
				6.43	6.47	6.42	6.44	3.72	3.72	3727	3673	3729
A089	174633	yes	yes	6.25	6.30	6.28	6.28	3.83	3.82	3822	3718	(-1.8%)
				6.45	6.51	6.49	6.48	3.72	3.72	3704	3650	3684
A083	174625	yes	yes	6.43	6.40	6.40	6.41	3.80	3.80	3744	3642	(-0.5%)
				6.55	6.54	6.49	6.53	3.68	3.68	3675	3622	3632
5157	176787	yes	yes	6.35	6.34	6.35	6.35	3.85	3.82	3780	3677	(-0.4%)
				6.45	6.45	6.49	6.46	3.70	3.70	3715	3661	3669
A125	174619	yes	yes	6.29	6.30	6.33	6.31	3.81	3.81	3803	3700	(-1.4%)
				6.46	6.48	6.49	6.48	3.70	3.70	3704	3650	3675
4789	176765	yes	yes	6.37	6.35	6.37	6.36	3.84	3.81	3774	3671	(+0.5%
				6.42	6.39	6.42	6.41	3.78	3.78	3744	3690	3681
A038	174631	yes	yes	6.35	6.37	6.38	6.37	3.78	3.78	3768	3665	(-1.2%
				6.54	6.50	6.55	6.53	3.70	3.70	3675	3622	3644

*Correction to 25 C, 760 mm Hg (see tables).
**scc/min = cc/min x correction factor.

Data Check by/Date Todd Fr. Lemmon 8/2/83
Form DSPC-012183

Battelle
Columbus Laboratories

DUPONT SAMPLING PUMP FLOW CALIBRATION

Performed by Lemmon/Sgontz Calibrator S/N ______ Amb. Temp. AM 26 °C PM 23 °C

Date/Time 7/14/83 AM 0630 PM 1830 Stop Watch S/N ______ Bar. Press. AM 767 PM 765 mm Hg

Flow Corr. Factor* AM 0.972 PM 0.9855

Pump S/N	EPA No.	Battery ok? (Yes/No)	Low Flow Check ok? (Yes/No)	Calibration Data								Avg. Flow from Pre- & Post Sampling Calibration, scc/min
				Bubble Meter, sec/400 cc, 0" Hg				Flow Meter Rdg, ℓ/m		Bubble Meter Flow		
				1	2	3	Avg	0" Hg	10" Hg	cc/min	scc/min**	
A037	174624	yes	yes	6.30	6.30	6.26	6.29	3.82	3.82	3816	3712	(-0.4%)
				6.43	6.41	6.37	6.40	3.80	3.80	3750	3696	3704
4696	176817	yes	yes	6.24	6.18	6.22	6.21	3.87	3.85	3865	3760	(-2.2%)
				6.44	6.40	6.44	6.43	3.80	3.79	3733	3679	3720
A126	174616	yes	yes	6.38	6.39	6.39	6.39	3.82	3.81	3756	3654	(-0.1%)
				6.48	6.45	6.52	6.48	3.72	3.72	3704	3650	3652
A087	174615	yes	yes	6.42	6.41	6.41	6.41	3.79	3.78	3744	3642	(-0.1%)
				6.49	6.53	6.48	6.50	3.72	3.70	3692	3638	3640
A127	174622	yes	yes	6.30	6.31	6.27	6.29	3.88	3.88	3816	3712	(+0.4%)
				6.38	6.34	6.32	6.35	3.79	3.79	3780	3725	3719
A032	174630	yes	yes	6.38	6.37	6.39	6.38	3.80	3.80	3762	3659	(+1.6%)
				6.38	6.37	6.34	6.36	3.75	3.75	3774	3719	3689
A120	174612	yes	yes	6.34	6.35	6.37	6.35	3.80	3.80	3780	3677	(-0.1%)
				6.41	6.45	6.45	6.44	3.73	3.75	3727	3673	3675

*Correction to 25 C, 760 mm Hg (see tables).
**scc/min = cc/min x correction factor.

Data Check by/Date Todd H. Lemmon 8/2/83
Form DSPC-012183

Battelle
Columbus Laboratories

DUPONT SAMPLING PUMP FLOW CALIBRATION

Performed by Sgontz / Howes
Date/Time 7/17/83 / AM 0630 PM 1800
Calibrator S/N
Stop Watch S/N
Amb. Temp. AM 24 °C PM 22 °C
Bar. Press. AM 765 PM 763 mm Hg
Flow Corr. Factor* AM 0.9804 PM 0.9828

Pump S/N	EPA No.	Battery ok? (Yes/No)	Low Flow Check ok? (Yes/No)	Calibration Data: Bubble Meter, sec/400 cc, 0" Hg: 1	2	3	Avg	Flow Meter Rdg, ℓ/m: 0" Hg	10" Hg	Bubble Meter Flow: cc/min	scc/min**	Avg. Flow from Pre- & Post Sampling Calibration, scc/min
A062	174628	yes	yes	6.14	6.15	6.17	6.15	3.90	3.89	3902	3826	(-2.3%)
				6.33	6.30	6.29	6.31	3.80	3.80	3803	3738	3782
5136	176798	yes	yes	6.10	6.15	6.14	6.13	3.91	3.90	3915	3838	(-2.1%)
				6.26	6.26	6.31	6.28	3.82	3.82	3822	3756	3797
A061	174632	yes	yes	6.21	6.18	6.21	6.20	3.89	3.90	3871	3795	(-0.7%)
				6.24	6.29	6.25	6.26	3.83	3.81	3834	3768	3782
5157	176781	yes	yes	6.10	6.13	6.18	6.14	3.92	3.92	3909	3832	(-1.7%)
				6.27	6.24	6.27	6.26	3.80	3.78	3834	3768	3800
9806	174626	yes	yes	6.25	6.27	6.26	6.26	3.86	3.87	3834	3759	(+1.9%)
				6.14	6.19	6.15	6.16	3.70	3.70	3896	3829	3794
A121	174618	yes	yes	6.32	6.34	6.32	6.33	3.80	3.80	3791	3717	(+1.5%)
				6.27	6.26	6.22	6.25	3.63	3.63	3840	3774	3746
A037	174624	yes	yes	6.32	6.33	6.35	6.33	3.80	3.80	3791	3717	(+0.6%)
				6.28	6.30	6.34	6.31	3.80	3.79	3803	3738	3728
A094	174623	yes	yes	6.35	6.37	6.34	6.35	3.79	3.79	3780	3706	(-0.7%)
				6.40	6.38	6.45	6.41	3.72	3.72	3744	3680	3693
A127	174622	yes	yes	6.30	6.32	6.29	6.30	3.84	3.82	3810	3735	(-0.9%)
				6.37	6.35	6.39	6.37	3.79	3.78	3768	3703	3719
5116	176819	yes	yes	6.19	6.18	6.18	6.18	3.88	3.85	3883	3807	(a)3807

*Correction to 25 C, 760 mm Hg (see tables).

**scc/min = cc/min x correction factor.

(a) [illegible]

Data Check by/Date Todd F. Lemmon 8/2/83
Form DSPC 012183

Battelle
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DUPONT SAMPLING PUMP FLOW CALIBRATION

Performed by Howes / Sgontz
Calibrator S/N
Amb. Temp. AM 23 PM 21 °C
Date/Time 7/18/83 AM PM
Stop Watch S/N
Bar. Press. AM 764 PM 764 mm Hg
Flow Corr. Factor* AM 0.9841 PM 0.9941

Pump S/N	EPA No.	Battery ok? (Yes/No)	Low Flow Check ok? (Yes/No)	Calibration Data								Avg. Flow from Pre- & Post Sampling Calibration, scc/min
				Bubble Meter, sec/400 cc, 0" Hg				Flow Meter Rdg, ℓ/m		Bubble Meter Flow		
				1	2	3	Avg	0" Hg	10" Hg	cc/min	scc/min**	
A032	174630	yes	yes	6.27	6.30	6.29	6.29	3.82	3.82	3816	3755	(-1.3%)
				6.41	6.46	6.44	6.44	3.72	3.72	3727	3705	3730
4779	176781	yes	yes	6.20	6.21	6.20	6.20	3.90	3.90	3871	3809	(-2.4%)
				6.37	6.44	6.44	6.42	3.70	3.70	3738	3716	3763
A118	174611	yes	yes	6.12	6.11	6.16	6.13	3.89	3.85	3915	3853	(-5.2%)
				6.51	6.56	6.51	6.53	3.72	3.71	3675	3653	3753
A089	174633	yes	yes	6.18	6.18	6.18	6.18	3.83	3.81	3883	3821	(-4.2%)
				6.55	6.51	6.51	6.52	—	—	3681	3659	3740
A120	174612	yes	yes	6.30	6.34	6.34	6.33	3.80	3.80	3791	3731	(-0.7%)
				6.42	6.45	6.46	6.44	3.73	3.75	3727	3705	3718
4696	176817	yes	yes	6.17	6.20	6.15	6.17	3.82	3.82	3890	3828	(-4.6%)
				6.55	6.51	6.54	6.53	3.70	3.70	3675	3653	3741
A092	174620	yes	yes	6.16	6.10	6.17	6.14	3.90	3.90	3909	3847	(-3.4%)
				6.40	6.44	6.41	6.42	3.76	3.75	3738	3716	3782
5138	176201	yes	yes	6.30	6.25	6.29	6.28	3.82	3.81	3822	3761	(-2.0%)
				6.50	6.46	6.46	6.47	3.69	3.69	3709	3687	3724
A126	174616	yes	yes	6.31	6.31	6.29	6.30	3.81	3.81	3810	3749	(+0.2%)
				6.35	6.31	6.38	6.35	3.72	3.72	3780	3758	3754
A143	174613	yes	yes	6.39	6.37	6.39	6.38	3.81	3.80	3762	3702	(+1.0%)
				6.40	6.36	6.38	6.38	3.70	3.70	3762	3740	3721

*Correction to 25 C, 760 mm Hg (see tables).
**scc/min = cc/min x correction factor.

Data Check by/Date Todd H. Lemmon 8/2/83
Form DSPC-012183

Battelle
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DUPONT SAMPLING PUMP FLOW CALIBRATION

Performed by Soontz / Howes Calibrator S/N ______ Amb. Temp. AM 24 PM 20 °C

Date/Time 7/28/83 AM 0635 PM Stop Watch S/N ______ Bar. Press. AM 766 PM 764 mm Hg

Flow Corr. Factor* AM 0.981 PM 0.999

Pump S/N	EPA No.	Battery ok? (Yes/No)	Low Flow Check ok? (Yes/No)	Calibration Data: Bubble Meter, sec/400 cc, 0" Hg 1	2	3	Avg	Flow Meter Rdg, ℓ/m 0" Hg	10" Hg	Bubble Meter Flow cc/min	scc/min**	Avg. Flow from Pre- & Post Sampling Calibration, scc/min
A087	174615	yes	yes	6.39	6.37	6.42	6.39	3.75	3.75	3756	3687	(-0.3%)
				6.53	6.54	6.50	6.52	3.69	3.67	3681	3677	3682
A118	174611	yes	yes	6.11	6.07	6.05	6.08	3.95	3.95	3947	3875	(-1.8%)
				6.32	6.28	6.29	6.30	3.80	3.79	3810	3806	3841
4696	176718	yes	yes	6.20	6.26	6.18	6.21	3.85	3.82	3865	3794	(-1.6%)
				6.42	6.42	6.42	6.42	3.70	3.70	3738	3734	3764
A089	174633	yes	yes	6.23	6.26	6.29	6.26	3.82	3.82	3834	3764	(-1.2%)
				6.46	6.45	6.43	6.45	3.71	3.70	3721	3717	3741
A143	174613	yes	yes	6.29	6.31	6.31	6.30	3.80	3.80	3810	3740	(+0.8%)
				6.35	6.32	6.40	6.36	3.78	3.78	3774	3770	3755
A083	174625	yes	yes	6.39	6.42	6.39	6.40	3.75	3.76	3750	3681	(-0.1%)
				6.53	6.52	6.51	6.52	3.69	3.69	3681	3677	3679
A121	174618	yes	yes	6.43	6.42	6.42	6.42	3.77	3.76	3738	3670	(-3.5%)
				6.78	6.76	6.77	6.77	3.51	3.29	3545	3541	3606
A062	174632	yes	yes	6.36	6.36	6.36	6.36	3.79	3.79	3774	3705	(-1.2%)
				6.53	6.55	6.57	6.55	3.61	3.61	3664	3660	3683

*Correction to 25 C, 760 mm Hg (see tables).
**scc/min = cc/min x correction factor.

Data Check by/Date Todd G. Lemmon 8/2/83

Form DSPC 012183

Battelle
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DUPONT SAMPLING PUMP FLOW CALIBRATION

Performed by Sapntz / Howes Calibrator S/N ______ Amb. Temp. AM 23 PM 20 °C

Date/Time 7/21/83 AM PM Stop Watch S/N ______ Bar. Press. AM 766 PM 763 mm Hg

Flow Corr. Factor* AM 0.986 PM 0.995

Pump S/N	EPA No.	Battery ok? (Yes/No)	Low Flow Check ok? (Yes/No)	Calibration Data: Bubble Meter, sec/400 cc, 0" Hg				Flow Meter Rdg, ℓ/m		Bubble Meter Flow		Avg. Flow from Pre- & Post Sampling Calibration, scc/min
				1	2	3	Avg	0" Hg	10" Hg	cc/min	scc/min**	
5116	176819	yes	yes	6.22	6.25	6.27	6.25	3.85	3.81	3840	3789	(-4.5%)
				6.59	6.59	6.62	6.60	3.61	3.60	3636	3618	3704
A092	174620	yes	yes	6.19	6.18	6.19	6.19	3.91	3.91	3877	3826	(-1.9%)
				6.34	6.38	6.37	6.36	3.79	3.79	3774	3755	3791
A125	174619	yes	yes	6.30	6.29	6.27	6.29	3.89	3.89	3816	3766	(-0.9%)
				6.38	6.40	6.41	6.40	3.72	3.72	3750	3731	3749
A061	174628	yes	yes	6.20	6.21	6.19	6.20	3.90	3.90	3871	3820	(-7.9%)
				6.77	6.82	6.79	6.79	3.55	3.55	3535	3517	3669
5157	176781	yes	yes	6.10	6.16	6.13	6.13	3.92	3.91	3915	3863	(-4.3%)
				6.44	6.47	6.46	6.46	3.72	3.72	3715	3696	3780
5136	176798	yes	yes	6.25	6.25	6.26	6.25	3.83	3.82	3840	3789	(-4.8%)
				6.60	6.63	6.64	6.62	3.61	3.61	3625	3607	3698
9806	174626	yes	yes	6.28	6.25	6.25	6.26	3.85	3.85	3834	3783	(-2.9%)
				6.48	6.51	6.52	6.50	3.69	3.69	3692	3674	3729
A038	174631	yes	yes	6.42	6.42	6.43	6.42	3.80	3.80	3738	3689	(-2.4%)
				6.61	6.65	6.63	6.63	3.52	3.51	3620	3602	3646
A120	174612	yes	yes	6.33	6.31	6.31	6.32	3.82	3.82	3797	3747	(-0.1%)
				6.38	6.39	6.38	6.38	3.76	3.76	3762	3743	3745
A126	174616	yes	yes	6.34	6.31	6.32	6.32	3.83	3.82	3797	3747	(-1.9%)
				6.50	6.48	6.52	6.50	3.68	3.67	3692	3674	3711

*Correction to 25 C, 760 mm Hg (see tables).

**scc/min = cc/min x correction factor.

Data Check by/Date Todd M. Lemmon 8/2/83

Form DSPC-012183

Battelle
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HIGH VOLUME PCB SAMPLER FLOW CALIBRATION

Performed by Lemmon, Sgontz, Jr.

Date/Time 6/28/83, 1930

Calibration Venturi S/N

Manometer S/N

Ambient Temperature 23.9 °C

Bar. Press. 740 mm Hg

Sampler S/N	Variac Setting, V	Timer OK? Yes/No	Calibration Venturi Data		Sampler Venturi Data		% Difference, Cal. & Smpl. Venturi Flow Rates	Comments
			Manometer, in. H_2O	Flow Rate, scm/min(a)	Magnehelic, in. H_2O	Flow Rate, scm/min(b)		
0002	110	✓	26.4	0.243	53	0.240	- 1.2	
EPA-95	110	✓	26.6	0.244	47	0.240	- 1.6	
6302	110	✓	27.3	0.247	51	0.260	+ 5.3	

(a) From Calibration Tables for Calibration Venturi Tube.
(b) From Calibration Tables for Venturi Tube in each Hi-Vol unit.

Data check by Todd F. Lemmon Date 7/6/83

Battelle
Columbus Laboratories

HIGH VOLUME PCB SAMPLER FLOW CALIBRATION

Performed by Lemmon / Sgontz, Jr.
Date/Time 6/28/83 1800
Calibration Venturi S/N ____
Manometer S/N ____
Ambient Temperature 29.4 C
Bar. Press. 740 mm Hg

Sampler S/N	Variac Setting, V	Timer OK? Yes/No	Calibration Venturi Data		Sampler Venturi Data		% Difference, Cal. & Smpl. Venturi Flow Rates	Comments
			Manometer, in. H_2O	Flow Rate, scm/min[(a)]	Magnehelic, in. H_2O	Flow Rate, scm/min[(b)]		
EPA-92	110	yes	26.6	0.244	48	0.242	− 0.8	
0001	"	"	26.7	0.245	48	0.245	0.0	
EPA-90	"	"	27.1	0.246	46	0.246	0.0	
EPA-1	"	"	26.6	0.244	30	0.235	− 3.7	
EPA-93	"	"	25.9	0.241	44	0.235	− 2.5	
① HEW-2	"	"	26.0	0.241	53	0.257	+ 6.6	
② "	"	"	26.9	0.246	55	0.262	+ 6.5	Repeat calibration
EPA-15	"	"	25.1	0.237	49	0.250	+ 5.5	
EPA-94	"	"	25.6	0.239	42	0.234	− 2.1	
EPA-13	"	"	25.7	0.240	43	0.231	− 3.8	

(a) From Calibration Tables for Calibration Venturi Tube.
(b) From Calibration Tables for Venturi Tube in each Hi-Vol unit.

Data check by: Todd H Lemmon Date 7/6/83

Battelle
Columbus Laboratories

HIGH VOLUME PCB SAMPLER FLOW CALIBRATION

Performed by Lemmon/Sgontz, Jr.
Date/Time 7/1/83 / 0840
Calibration Venturi S/N
Manometer S/N
Ambient Temperature 81 °C
Bar. Press. 741 mm Hg

Sampler S/N	Variac Setting, V	Timer OK? Yes/No	Calibration Venturi Data		Sampler Venturi Data		% Difference, Cal. & Sple. Venturi Flow Rates	Comments
			Manometer, in. H_2O	Flow Rate, scm/min[a]	Magnehelic, in. H_2O	Flow Rate, scm/min[b]		
0002	110	✓	26.9	0.246	51	0.236	- 4.1	
EPA-95	110	✓	26.5	0.244	48	0.242	- 0.8	
6302	110	✓	27.0	0.246	68	0.295	+ 19.9 *	Flow rate check unacceptable, sampler removed from use. Found piece of Teflon tape blocking venturi. Flow data for 6/29/83 and 6/30/83 are questionable.

(a) From Calibration Tables for Calibration Venturi Tube.
(b) From Calibration Tables for Venturi Tube in each Hi-Vol unit.

Data check by Todd F. Lemmon Date 7/6/83

Battelle
Columbus Laboratories

HIGH VOLUME PCB SAMPLER FLOW CALIBRATION

Performed by Lemmon/Sgontz, Jr.
Date/Time 7/1/83 / 1015
Calibration Venturi S/N
Manometer S/N
Ambient Temperature 28.9 °C
Bar. Press. 741 mm Hg

Sampler S/N	Variac Setting, V	Timer OK? Yes/No	Calibration Venturi Data		Sampler Venturi Data		% Difference, Cal. & Sple. Venturi Flow Rates	Comments
			Manometer, in. H_2O	Flow Rate, scm/min[a]	Magnehelic, in. H_2O	Flow Rate, scm/min[b]		
EPA-15	110	yes	27.6	0.249	48	0.247	− 0.8	
EPA-90	"	"	27.6	0.249	45	0.243	− 2.4	
EPA-1	"	"	26.3	0.243	30	0.235	− 3.3	
0001	"	"	26.2	0.243	47	0.243	0.0	
EPA-92	"	"	26.7	0.245	48	0.242	− 1.2	
EPA-93	"	"	26.6	0.244	46	0.241	− 1.2	

(a) From Calibration Tables for Calibration Venturi Tube.
(b) From Calibration Tables for Venturi Tube in each Hi-Vol unit.

Data check by Todd Fr Lemmon Date 7/6/83

Battelle
Columbus Laboratories

HIGH VOLUME PCB SAMPLER FLOW CALIBRATION

Performed by Lemmon/Sgontz, Jr.
Date/Time 7/10/83 1610
Calibration Venturi S/N
Manometer S/N
Ambient Temperature 99 °C
Bar. Press. 741 mm Hg

Sampler S/N	Variac Setting, V	Timer OK? Yes/No	Calibration Venturi Data		Sampler Venturi Data		% Difference, Cal. & Sple. Venturi Flow Rates	Comments
			Manometer, in. H_2O	Flow Rate, scm/min[a]	Magnehelic, in. H_2O	Flow Rate, scm/min[b]		
6302	110	yes	26.5	0.244	78	—	—	Couldn't calibrate *
0002	"	"	26.6	0.244	50	0.234	- 4.1	
EPA-95	"	"	25.6	0.239	45	0.235	- 1.7	
10484	"	"	24.0	0.231	52	0.225	- 2.6	
EPA-13	"	"	24.6	0.234	43	0.231	- 1.3	
								* See 7/1/83 calibration
								data

(a) From Calibration Tables for Calibration Venturi Tube.
(b) From Calibration Tables for Venturi Tube in each Hi-Vol unit.

Data check by Todd M. Lemmon Date 8/3/83

Battelle
Columbus Laboratories

HIGH VOLUME PCB SAMPLER FLOW CALIBRATION

Performed by Lemmon/Sgontz, Jr.
Date/Time 7/11/83 0845
Calibration Venturi S/N
Manometer S/N
Ambient Temperature 26.7 °C
Bar. Press. 742 mm Hg

Sampler S/N	Variac Setting, V	Timer OK? Yes/No	Calibration Venturi Data		Sampler Venturi Data		% Difference, Cal. & Sple. Venturi Flow Rates	Comments
			Manometer, in. H_2O	Flow Rate, scm/min[a]	Magnehelic, in. H_2O	Flow Rate, scm/min[b]		
EPA-15	110	yes	26.6	0.244	46	0.242	− 0.8	
EPA-90	"	"	26.6	0.244	44	0.241	−1.2	
EPA-1	"	"	26.1	0.242	30	0.235	−2.9	
0001	"	"	26.9	0.246	47	0.243	−1.2	
EPA-92	"	"	26.6	0.244	48	0.242	−0.8	
EPA-93	"	"	26.5	0.244	46	0.241	−1.2	
EPA-94	"	"	26.5	0.244	45	0.241	−1.2	

(a) From Calibration Tables for Calibration Venturi Tube.
(b) From Calibration Tables for Venturi Tube in each Hi-Vol unit.

Data check by Todd Fr. Lemmon Date 8/2/83

Battelle
Columbus Laboratories

HIGH VOLUME PCB SAMPLER FLOW CALIBRATION

Performed by Lemmon /Sgontz, Jr.
Date/Time 7/13/83 0930
Calibration Venturi S/N
Manometer S/N
Ambient Temperature 26.7 °C
Bar. Press. 741 mm Hg

Sampler S/N	Variac Setting, V	Timer OK? Yes/No	Calibration Venturi Data		Sampler Venturi Data		% Difference, Cal. & Spls. Venturi Flow Rates	Comments
			Manometer, in. H_2O	Flow Rate, scm/min[a]	Magnehelic, in. H_2O	Flow Rate, scm/min[b]		
0002	110	yes	27.3	0.247	51	0.236	- 4.5	
10484	"	no	26.2	0.242	59	0.239	- 1.2	
EPA-13	"	yes	27.1	0.246	48	0.245	- 0.4	
EPA-95	"	yes	26.7	0.245	47	0.240	- 2.0	

(a) From Calibration Tables for Calibration Venturi Tube.
(b) From Calibration Tables for Venturi Tube in each Hi-Vol unit.

Data check by Todd M. Lemmon Date 8/3/83

Battelle
Columbus Laboratories

HIGH VOLUME PCB SAMPLER FLOW CALIBRATION

Performed by Sgontz, Jr.
Date/Time 7/15/83 1540
Calibration Venturi S/N
Manometer S/N
Ambient Temperature 37.8 °C
Bar. Press. 764 mm Hg

Sampler S/N	Variac Setting, V	Timer OK? Yes/No	Calibration Venturi Data		Sampler Venturi Data		% Difference, Cal. & Sple. Venturi Flow Rates	Comments
			Manometer, in. H_2O	Flow Rate, scm/min[a]	Magnehelic, in. H_2O	Flow Rate, scm/min[b]		
EPA-15	110	yes	27.0	0.246	47	0.245	− 0.4	
EPA-90	"	"	24.0	0.231	39	0.228	− 1.3	
EPA-93	"	"	23.7	0.230	41	0.227	− 1.3	
0002	"	"	25.4	0.238	46	0.226	− 5.0	
EPA-92	"	"	22.0	0.221	42	0.228	+ 3.2	
EPA-95	"	"	24.8	0.235	42	0.227	− 3.4	
10484	"	"	24.4	0.233	53	0.227	− 2.6	
EPA-1	"	"	24.6	0.234	29	0.231	− 1.3	
EPA-94	"	"	23.6	0.229	39	0.226	− 1.3	
1000	"	"	23.0	0.226	40	0.226	0.0	

(a) From Calibration Tables for Calibration Venturi Tube.
(b) From Calibration Tables for Venturi Tube in each Hi-Vol unit.

Data check by Todd Fr. Lemmon Date 8/2/83

Battelle
Columbus Laboratories

HIGH VOLUME PCB SAMPLER FLOW CALIBRATION

Performed by Sgontz / Howes

Date/Time 7/19/83 1800

Calibration Venturi S/N

Manometer S/N

Ambient Temperature 36.1 °C

Bar. Press. 764 mm Hg

Sampler S/N	Variac Setting, V	Timer OK? Yes/No	Calibration Venturi Data		Sampler Venturi Data		% Difference, Cal. & Sple. Venturi Flow Rates	Comments
			Manometer, in. H_2O	Flow Rate, scm/min(a)	Magnehelic, in. H_2O	Flow Rate, scm/min(b)		
EPA-92	110	yes	23.5	0.229	41	0.225	- 1.7	
0002	"	"	26.0	0.241	46	0.226	- 6.2	
EPA-93	"	"	24.5	0.234	41	0.227	- 3.0	
EPA-94	"	"	22.9	0.226	39	0.226	0.0	
10484	"	no	20.0	0.210	53	0.227	+ 8.1	
EPA-95	"	yes	22.0	0.221	42	0.227	+ 2.7	
1000	"	yes	22.8	0.225	40	0.226	+ 0.4	

(a) From Calibration Tables for Calibration Venturi Tube.

(b) From Calibration Tables for Venturi Tube in each Hi-Vol unit.

* Based on calibration curve with GMW Calibrator

Data check by Todd H. Lemmon Date 8/3/83

Battelle
Columbus Laboratories

HIGH VOLUME PCB SAMPLER FLOW CALIBRATION

Performed by Spontz / Howes
Date/Time 7/22/83 0800
Calibration Venturi S/N
Manometer S/N
Ambient Temperature 33.3 °C
Bar. Press. 766 mm Hg

Sampler S/N	Variac Setting, V	Timer OK? Yes/No	Calibration Venturi Data		Sampler Venturi Data		% Difference, Cal. & Spls. Venturi Flow Rates	Comments
			Manometer, in. H_2O	Flow Rate, scm/min[a]	Magnehelic, in. H_2O	Flow Rate, scm/min[b]		
EPA-92	110	yes	24.0	0.231	42	0.228	- 1.3	
EPA-93	"	"	24.0	0.231	41	0.227	- 1.7	
EPA-94	"	"	22.9	0.226	39	0.226	0.0	
0002	"	"	26.3	0.243	46	0.226	- 7.0	
10484	"	no	23.4	0.228	50	0.221	- 3.1	
1000	"	yes	21.8	0.220	40	0.226	+ 2.7	

(a) From Calibration Tables for Calibration Venturi Tube.
(b) From Calibration Tables for Venturi Tube in each Hi-Vol unit.

Data check by Todd G. Lemmon Date 8/3/83

APPENDIX E

EPA FLOW AUDIT REPORT

FLOW AUDIT OF THE BLOOMINGTON, INDIANA PCB MONITORING SITES

by

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Environmental Monitoring Systems Laboratory
U.S. Environmental Protection Agency
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Bloomington, Indiana PCB Study Audit

1.0 INTRODUCTION

On June 30, 1983, a flow audit was conducted on the sampling devices used to monitor airborne PCB's at two sites in Bloomington, Indiana. Twenty portable Dupont sampling pumps and seven pesticide samplers were audited. The audits consisted of measuring the flows immediately after the Battelle morning calibration and again after the 8 hour sampling run. Sampling began around 9 a.m. and ended near 5 p.m.

2.0 SUMMARY AND RECOMMENDATIONS

The sampling portion of this study was being handled very well. Flows were being checked before and after sampling and the audit showed all flows well within the ± 10% QAD tolerance interval. The flow errors for the smaller portable battery operated pumps averaged less than -3%, while the errors for the higher volume pesticide samplers averaged just over 5%.

Chain of custody procedures were being followed for the 8 hour samples. A Battelle employee would be with the samplers during the entire sampling period, and samples were carefully sealed in glass containers. The gate to the landfill was being locked to secure the sampling area during the overnight or 24 hour sampling runs.

3.0 AUDIT PROCEDURES

Two PCB sampling sites were located in the Bloomington area. The largest number of pesticide samplers was at the Neal's Landfill site, thus it was chosen as the audit site. Seven of these were audited prior to their respective sampling periods. Two were audited at the end of their 8 hour sampling runs.

Since the Dupont portable sampling pumps were being calibrated in a motel room, the pumps used at both sites could be audited immediately after Battelle's pre-sampling flow calibration and in the evening at the end of the 8 hour sampling period. Twenty-five pumps were audited in the morning, and twenty in the evening. Five pumps were carried to the field as spares but not utilized.

Flows were audited using two laminar flow elements (LFE's), S/N 34665 and S/N 701621, which had been verified with LFE's calibrated by the National Bureau of Standards. Care was taken to assure that the pumps were not impeded by the LFE's. Each laminar flow element was chosen to introduce a pressure drop of only 1 to 2 inches of water in the system. In measuring flows for both samplers the LFE's were placed upstream of the blank sampling media. A clean filter or a polyurethane foam plug was used to simulate actual initial operating conditions.

4.0 RESULTS

As shown in Table I, all of the Dupont pumps performed very well having an average accuracy of -2.8 percent. This negative figure does indicate some small amount of systematic bias. The average percent difference for the 8 CFM pesticide samplers was a +5.2 percent (Table II). Both sets of samplers showed individual as well as average percent differences well below the 10 percent limit set by QAD as a maximum allowable error.

The field portion of the study and particularly the pump flows seemed to be handled very well.

Table I

FLOW AUDIT

Bloomington, Indiana

	PUMP SERIAL NUMBER	INITIAL CALIBRATION FLOW CC/MIN	FINAL CALIBRATION FLOW CC/MIN	AUDIT FLOW CC/MIN	DIFFERENCE		
					CC/MIN	PERCENT	
	A087	3572	---	3712		-3.8	
	A087	---	3586	3695		-2.9	
	A143	3578	---	3688		-3.0	
	A143	---	3541	3675		-3.6	
	A094	3606		3677		-1.9	
	A094		3514	3643		-3.5	
	5157	3765	---	3836		-1.9	
	5157	---	3649	3768		-3.2	
	A127	3735	---	3804		-1.9	
	A127	---	3632	3739		-2.9	
	5116	3785	---	3913		-3.3	
	5116	---	3776	3885		-2.8	

ALL FLOWS AT STP

Table I (con't.)

FLOW AUDIT

Bloomington, Indiana

	PUMP SERIAL NUMBER	INITIAL CALIBRATION FLOW CC/MIN	FINAL CALIBRATION FLOW CC/MIN	AUDIT FLOW CC/MIN	DIFFERENCE		
					CC/MIN	PERCENT	
	A061	3687	---	3805		-3.1	
	A061	---	3632	3749		-3.1	
	A118	3729	---	3826		-2.5	
	A118	---	3621	3742		-3.2	
	A089	3765	---	3889		-3.2	
	A089	---	3727	3784		-1.5	
	A088	3492	---	3603		-3.1	
	A088	---	3482	3635		-4.2	
	A092	3742	---	3770		-0.7	
	A092	---	3709	3836		-3.3	
	4696	3753	---	3837		-2.2	
	4696	---	3684	3771		-2.3	

ALL FLOWS AT STP

Table I (con't.)

FLOW AUDIT

Bloomington, Indiana

	PUMP SERIAL NUMBER	INITIAL CALIBRATION FLOW CC/MIN	FINAL CALIBRATION FLOW CC/MIN	AUDIT FLOW CC/MIN	DIFFERENCE		
					CC/MIN	PERCENT	
	4779	3747	---	3827		-2.1	
	4779	---	3673	3790		-3.1	
	A126	3589	---	3636		-1.3	
	A126	---	3514	3622		-3.0	
	A062	3747	---	3816		-1.8	
	A062	---	3727	3778		-1.3	
	A121	3704	---	3805		-2.7	
	A121	---	3709	3844		-3.5	
	A083	3536	---	3652		-3.2	
	A083	---	3617	3710		-2.5	
	A037	3753	---	3900		-3.8	
	A037	---	3770	3890		-3.1	

ALL FLOWS AT STP

Table I (con't.)

FLOW AUDIT

Bloomington, Indiana

	PUMP SERIAL NUMBER	INITIAL CALIBRATION FLOW CC/MIN	FINAL CALIBRATION FLOW CC/MIN	AUDIT FLOW CC/MIN	DIFFERENCE		
					CC/MIN	PERCENT	
	A125	3735	---	3858		-3.2	
	A125	---	3691	3844		-4.0	
	A080	3747	---	3858		-2.9	
	A080	---	3643	3771		-3.4	
				Average		-2.8	

ALL FLOWS AT STP

Table I

FLOW AUDIT

Bloomington, Indiana

	PUMP SERIAL NUMBER	INITIAL CALIBRATION FLOW CC/MIN	FINAL CALIBRATION FLOW CC/MIN	AUDIT FLOW CC/MIN	DIFFERENCE		
					CC/MIN	PERCENT	
	EPA 15	224,375	---	216,728	7,647	3.5	
	EPA 15	---	212,879	200,653	12,226	6.1	
	EPA 90	223,951	---	214,176	9,775	4.6	
	EPA-1	221,770	---	217,145	4,625	2.1	
	HEW-2	221,544	---	211,118	10,426	4.9	
	EPA 93	223,413	---	212,333	11,080	5.2	
	EPA 93	---	223,413	208,962	14,451	6.9	
	EPA 92	221,742	---	208,124	13,618	6.5	
	EPA 0001	226,528	---	212,324	14,204	6.7	
					Average	5.2	

ALL FLOWS AT STP

APPENDIX F

METEOROLOGICAL DATA

The meteorological data recorded during the PCB monitoring study are presented in this appendix. Wind speed, wind direction, and ambient temperature were recorded continuously during the field monitoring program. The data were visually reduced to obtain the hourly averages values reported here. The relative humidity data reported are from individual measurements made during the sampling periods.

Wind speed, wind direction, and ambient temperature was measured with Meteorological Research, Inc., portable weather stations. One station was operated at Neal's Landfill during the entire field program, i.e., during sampling at all three landfill sites. Another station was located at Neal's Dump and Lemon Landfill during the PCB monitoring periods at these sites.

METEOROLOGICAL DATA[(a)]

Date: 6/28/83 Site: Neal's Landfill

Time Period Hrs, EST	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100				
0100-0200				
0200-0300				
0300-0400				
0400-0500				
0500-0600				
0600-0700				
0700-0800				
0800-0900				
0900-1000				
1000-1100				
1100-1200				
1200-1300				
1300-1400				
1400-1500	0.58	160	33	
1500-1600	0.72	200	30	
1600-1700	0.31	190	29	
1700-1800	0.09	220	27	
1800-1900	0	130	24	
1900-2000	0	140	22	
2000-2100	0	150	21	
2100-2200	0	80	21	
2200-2300	0	80	21	
2300-2400	0	130	21	

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA[a]

Date: 6/29/83

Site: Neal's Landfill

Time Period Hrs, EST	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100	0	140	20	
0100-0200	0	180	20	
0200-0300	0	290	19	
0300-0400	0	310	19	
0400-0500	0	270	19	
0500-0600	0	160	22	
0600-0700	0.13	160	24	
0700-0800	0.09	160	26	
0800-0900	0.27	160	28	
0900-1000	0.49	140	29	
1000-1100	0.72	170	31	
1100-1200	0.63	160	32	
1200-1300	1.16	170	32	
1300-1400	1.30	160	32	
1400-1500	0.58	160	32	
1500-1600	0.89	160	32	
1600-1700	0.76	160	31	
1700-1800	0.13	160	30	
1800-1900	0	130	28	
1900-2000	0.54	190		
2000-2100	0.18	230	26	
2100-2200	0	110	24	
2200-2300	0	130	23	
2300-2400	0	150	21	

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA(a)

Date: 6/30/83 Site: Neal's Landfill

Time Period Hrs, EST	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100	0	150	21	
0100-0200	0	170	21	
0200-0300	0.04	160	23	
0300-0400	0.04	160	23	
0400-0500	0.04	160	23	
0500-0600	0.09	170	23	
0600-0700	0.22	190	23	
0700-0800	0.80	200	23	
0800-0900	0.76	220	23	
0900-1000	0.63	230	25	
1000-1100	1.07	220	27	
1100-1200	1.30	220	29	
1200-1300	1.12	220	31	
1300-1400	1.07	230	31	
1400-1500	1.03	240	31	
1500-1600	0.36	250	31	
1600-1700	0.27	260	32	
1700-1800	0	220	31	
1800-1900	0	160	30	
1900-2000	0	165	28	
2000-2100	0	160	25	
2100-2200	0.04	160	24	
2200-2300	0.18	165	25	
2300-2400	0.18	170	25	

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA[a]

Date: 7/1/83

Site: Neal's Landfill

Time Period Hrs, EST	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100	0.09	165	24	
0100-0200	0.18	160	23	
0200-0300	0.40	170	23	
0300-0400	0.27	170	23	
0400-0500	0.18	170	23	
0500-0600	0.49	180	23	
0600-0700	0.48	195	25	
0700-0800	0.49	200	27	
0800-0900	0.89	220	29	
0900-1000	0.63	220	31	
1000-1100				
1100-1200				
1200-1300				
1300-1400				
1400-1500				
1500-1600				
1600-1700				
1700-1800				
1800-1900				
1900-2000				
2000-2100				
2100-2200				
2200-2300				
2300-2400				

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA[a]

Date: 7/11/83 Site: Neal's Landfill

Time Period Hrs, EST	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100				
0100-0200				
0200-0300				
0300-0400				
0400-0500				
0500-0600				
0600-0700				
0700-0800				
0800-0900				
0900-1000	0.72	270	36	
1000-1100	0.80	300	37	
1100-1200	0.72	290	38	
1200-1300	0.76	300	38	
1300-1400	0.80	240	37	
1400-1500	1.34	200	36	
1500-1600	0.98	200	34	
1600-1700	0.09	180	33	
1700-1800	0	160	31	
1800-1900	0	140	27	
1900-2000	0	165	24	
2000-2100	0	230	23	
2100-2200	0	160	22	
2200-2300	0	150	22	
2300-2400	0	80	22	

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA(a)

Date: 7/12/83

Site: Neal's Landfill

Time Period Hrs, EST	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100	0	10	23	
0100-0200	0	40	22	
0200-0300	0	40	23	
0300-0400	0	180	23	
0400-0500	0	180	24	
0500-0600	0.04	230	25	
0600-0700	0.40	230	27	
0700-0800	0.58	260	31	
0800-0900	0.67	280	35	
0900-1000	0.76	250	37	
1000-1100	0.80	260	38	
1100-1200	0.89	280	39	
1200-1300	0.45	280	41	
1300-1400	0.58	270	39	
1400-1500	0.54	260	39	
1500-1600	0.54	250	38	
1600-1700	0.04	190	35	
1700-1800	0	140	32	
1800-1900	0	150	29	
1900-2000	0	150	27	
2000-2100	0.09	120	26	
2100-2200	0	150	24	
2200-2300	0	120	24	
2300-2400	0	120	23	

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA(a)

Date: 7/13/83

Site: Neal's Landfill

Time Period Hrs, EST	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100	0	90	23	
0100-0200	0	170	22	
0200-0300	0	140	22	
0300-0400	0	150	21	
0400-0500	0	210	21	
0500-0600	0	220	24	
0600-0700	0	130	28	
0700-0800	0.13	120	32	
0800-0900	0.13	30	35	
0900-1000	0.36	340	37	
1000-1100	0.27	20	39	
1100-1200	0.27	300	39	
1200-1300	0.76	280	39	
1300-1400	0.31	300	39	
1400-1500	0.09	290	38	
1500-1600	0	10	36	
1600-1700	0	110	33	
1700-1800	0	150	31	
1800-1900	0	180	28	
1900-2000	0	180	27	
2000-2100	0	180	26	
2100-2200	0	180	25	
2200-2300	0	140	24	
2300-2400	0	150	24	

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA[a]

Date: 7/14/83 Site: Neal's Landfill

Time Period Hrs, EST	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100	0	160	23	
0100-0200	0	180	23	
0200-0300	0	170	22	
0300-0400	0	210	22	
0400-0500	0	200	23	
0500-0600	0	190	27	
0600-0700	0.09	310	31	
0700-0800	0.36	300	34	
0800-0900	0.49	280	35	
0900-1000	0.45	295	36	
1000-1100	0.40	290	37	
1100-1200	1.07	220	37	
1200-1300	0.72	230	36	
1300-1400	0.36	240	36	
1400-1500	0.09	220	35	
1500-1600	0.09	190	34	
1600-1700	0	140	33	
1700-1800	0	140	32	
1800-1900	0	180	28	
1900-2000	0	200	26	
2000-2100	0	190	25	
2100-2200	0	165	24	
2200-2300	0	170	23	
2300-2400	0	160	22	

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA(a)

Date: 7/15/83

Site: Neal's Landfill

Time Period Hrs, EST	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100	0	160	22	
0100-0200	0	160	22	
0200-0300	0	140	22	
0300-0400	0	270	22	
0400-0500	0	170	23	
0500-0600	0	180	24	
0600-0700	0	190	28	
0700-0800	0.04	230	32	
0800-0900	0.85	260	35	
0900-1000	0.98	220	36	
1000-1100	0.94	240	36	
1100-1200	1.25	240	36	
1200-1300	0.94	270	37	
1300-1400	0.49	250	37	
1400-1500	0.18	270	36	
1500-1600	0.04	180	33	
1600-1700	0	110	30	
1700-1800	0	130	27	
1800-1900	0	170	25	
1900-2000	0	190	24	
2000-2100	0	195	24	
2100-2200	0	170	23	
2200-2300	0	120	23	
2300-2400	0	160	22	

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA(a)

Date: 7/16/83

Site: Neal's Landfill

Time Period Hrs, EST	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100	0	130	22	
0100-0200	0	360	23	
0200-0300	0	130	22	
0300-0400	0	150	21	
0400-0500	0	150	21	
0500-0600	0	100	24	
0600-0700	0	300	28	
0700-0800	0.11	290	29	
0800-0900	0.94	320	32	
0900-1000	1.07	300	34	
1000-1100	1.43	270	36	
1100-1200	1.12	290	37	
1200-1300	0.89	260	37	
1300-1400	0.85	280	38	
1400-1500	0.63	260	37	
1500-1600	0.80	290	37	
1600-1700	0.13	290	36	
1700-1800	0	270	35	
1800-1900	0	190	31	
1900-2000	0	180	26	
2000-2100	0	160	25	
2100-2200	0	130	24	
2200-2300	0	150	24	
2300-2400	0	170	24	

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA(a)

Date: 7/17/83

Site: Neal's Landfill

Time Period Hrs, EST	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100	0	130	24	
0100-0200	0	180	22	
0200-0300	0	160	23	
0300-0400	0	160	23	
0400-0500	0	170	22	
0500-0600	0	130	23	
0600-0700	0.04	290	28	
0700-0800	0.40	300	32	
0800-0900	0.72	300	35	
0900-1000	1.16	280	36	
1000-1100	1.83	280	37	
1100-1200	1.97	280	37	
1200-1300	1.12	280	38	
1300-1400	1.07	320	36	
1400-1500	0.45	360	33	
1500-1600	0.09	360	34	
1600-1700	0	50	33	
1700-1800	0	120	32	
1800-1900	0	160	28	
1900-2000	0	140	27	
2000-2100	0	170	26	
2100-2200	0	150	25	
2200-2300	0	160	24	
2300-2400	0	140	24	

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA(a)

Date: 7/18/83 Site: Neal's Landfill

Time Period Hrs, EST	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100	0	130	24	
0100-0200	0.04	190	24	
0200-0300	0	230	24	
0300-0400	0	200	24	
0400-0500	0	200	24	
0500-0600	0	60	24	
0600-0700	0.22	270	27	
0700-0800	0.27	290	31	
0800-0900	0.31	310	35	
0900-1000	0.63	300	38	
1000-1100	0.67	290	41	
1100-1200	0.85	250	40	
1200-1300	1.21	250	39	
1300-1400	1.03	260	39	
1400-1500	1.39	280	39	
1500-1600	0.94	210	31	
1600-1700	0	180	30	
1700-1800	0	120	30	
1800-1900	0	170	27	
1900-2000	0	180	26	
2000-2100	0	160	25	
2100-2200	0	180	24	
2200-2300	0	140	24	
2300-2400	0	160	23	

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA[a]

Date: 7/19/83 Site: Neal's Landfill

Time Period Hrs, EST	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100	0	160	24	
0100-0200	0	160	24	
0200-0300	0	180	24	
0300-0400	0	150	24	
0400-0500	0	230	25	
0500-0600	0	200	27	
0600-0700	0.22	290	31	
0700-0800	0.54	310	34	
0800-0900	1.16	310	37	
0900-1000	1.43	310	38	
1000-1100	1.12	320	39	
1100-1200	1.34	310	41	
1200-1300	1.43	290	41	
1300-1400	1.25	310	40	
1400-1500	0.89	290	41	
1500-1600	0.67	360	39	
1600-1700	0.13	360	37	
1700-1800	0	80	36	
1800-1900	0	130	31	
1900-2000	0	150	28	
2000-2100	0	170	27	
2100-2200	0	80	26	
2200-2300	0	80	26	
2300-2400	0	160	25	

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA(a)

Date: 7/20/83 Site: Neal's Landfill

Time Period Hrs, EST	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100	1.34	360	26	
0100-0200	0.40	280	25	
0200-0300	0.76	170	24	
0300-0400	0.27	170	24	
0400-0500	0	150	24	
0500-0600	0.04	320	26	
0600-0700	0.09	230	29	
0700-0800	0.89	220	32	
0800-0900	1.39	240	36	
0900-1000	0.85	270	38	
1000-1100	1.61	290	39	
1100-1200	1.34	300	41	
1200-1300	1.52	270	42	
1300-1400	1.79	280	42	
1400-1500	1.74	260	41	
1500-1600	1.43	280	41	
1600-1700	1.07	280	39	
1700-1800	0.22	280	37	
1800-1900	0	330	34	
1900-2000	0	160	31	
2000-2100	0	165	28	
2100-2200	0	150	28	
2200-2300	0.09	200	29	
2300-2400		280	29	

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA(a)

Date: 7/21/83

Site: Neal's Landfill

Time Period Hrs, EST	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100	0	160	29	
0100-0200	0	150	27	
0200-0300	0	170	26	
0300-0400	0	170	26	
0400-0500	0	180	26	
0500-0600	0.09	210	28	
0600-0700	0.36	260	32	
0700-0800	0.67	280	36	
0800-0900	1.16	300	38	
0900-1000	1.16	310	40	
1000-1100	1.65	300	41	
1100-1200	2.32	290	41	
1200-1300	1.97	270	42	
1300-1400	1.88	270	42	
1400-1500	1.97	275	42	
1500-1600	1.30	265	41	
1600-1700	1.30	280	40	
1700-1800	0.13	280	38	
1800-1900	0	160	33	
1900-2000	0	130	30	
2000-2100	0	170	28	
2100-2200	0	170	27	
2200-2300	0	180	26	
2300-2400	0	180	25	

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA(a)

Date: 7/22/83 Site: Neal's Landfill

Time Period Hrs, EST	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100	0	140	25	
0100-0200	0	130	26	
0200-0300	0	170	25	
0300-0400	0	165	24	
0400-0500	0	185	25	
0500-0600	0.09	240	28	
0600-0700	0.27	300	32	
0700-0800	0.49	290	36	
0800-0900	1.25	310	37	
0900-1000	1.56	310	39	
1000-1100				
1100-1200				
1200-1300				
1300-1400				
1400-1500				
1500-1600				
1600-1700				
1700-1800				
1800-1900				
1900-2000				
2000-2100				
2100-2200				
2200-2300				
2300-2400				

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA[a]

Date: 6/28/83 Site: Neal's Dump

Time Period Hrs, EST	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100				
0100-0200				
0200-0300				
0300-0400				
0400-0500				
0500-0600				
0600-0700				
0700-0800				
0800-0900				
0900-1000				
1000-1100				
1100-1200	1.12	200	30	
1200-1300	1.25	210	32	
1300-1400	1.12	210	32	
1400-1500	1.39	170	31	
1500-1600	1.43	200	31	
1600-1700	1.16	190	28	
1700-1800	0.94	230	24	
1800-1900	0.67	170	23	
1900-2000	0.36	300	22	
2000-2100	0.22	80	22	
2100-2200	0.22	80	21	
2200-2300	0.13	80	21	
2300-2400	0.22	100	20	

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA(a)

Date: 6/29/83

Site: Neal's Dump

Time Period Hrs, EST	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100	0.09	70	21	
0100-0200	0.09	80	20	
0200-0300	0.13	100	19	
0300-0400	0.13	50	19	
0400-0500	0.45	80	21	
0500-0600	0.45	90	22	
0600-0700	0.54	90	23	
0700-0800	(b)	(b)	(b)	
0800-0900	(b)	(b)	(b)	
0900-1000	(b)	(b)	(b)	
1000-1100	(b)	(b)	(b)	
1100-1200	1.88	130	33	
1200-1300	2.82	135	33	
1300-1400	2.55	135	33	
1400-1500	2.73	130	33	63
1500-1600	2.24	135	32	64
1600-1700	1.74	140	31	62
1700-1800	0.45	90	29	
1800-1900	0.94	300	26	
1900-2000	0.45	270	23	
2000-2100	0.49	70	22	
2100-2200	0.31	330	22	
2200-2300	0.27	40	21	
2300-2400	0.22	360	21	

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

(b) Data missing due to malfunction of chart feed.

METEOROLOGICAL DATA[a]

Date: 6/30/83 Site: Neal's Dump

Time Period Hrs, EST	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100	0.54	300	20	
0100-0200	0.40	80	20	
0200-0300	0.18	40	20	
0300-0400	0.45	100	21	
0400-0500	0.54	140	22	
0500-0600	0.63	210	23	
0600-0700	1.30	220	24	
0700-0800	1.29	230	25	83
0800-0900	1.30	230	26	79
0900-1000	1.39	230	28	69
1000-1100	1.79	230	31	67
1100-1200	1.74	240	31	61
1200-1300	1.65	260	32	
1300-1400	1.88	260	32	59
1400-1500	1.56	270	31	62
1500-1600	1.52	280	31	
1600-1700	0.94	300	31	
1700-1800	0.27	300	29	
1800-1900	0.36	60	26	
1900-2000	0.36	90	23	
2000-2100	0.27	170	22	
2100-2200	0.18	50	22	
2200-2300	0.40	180	22	
2300-2400	0.40	90	22	

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA[a]

Date: 7/1/83

Site: Neal's Dump

Time Period Hrs, EST	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100	0.40	100	22	
0100-0200	0.63	130	21	
0200-0300	0.58	140	22	
0300-0400	0.49	140	22	
0400-0500	0.76	180	23	
0500-0600	1.61	200	26	
0600-0700	1.30	220	29	
0700-0800				
0800-0900				
0900-1000				
1000-1100				
1100-1200				
1200-1300				
1300-1400				
1400-1500				
1500-1600				
1600-1700				
1700-1800				
1800-1900				
1900-2000				
2000-2100				
2100-2200				
2200-2300				
2300-2400				

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA[(a)]

Date: 7/11/83

Site: Neal's Dump

Time Period Hrs, EST	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100				
0100-0200				
0200-0300				
0300-0400				
0400-0500				
0500-0600				
0600-0700				
0700-0800				
0800-0900				
0900-1000				
1000-1100				
1100-1200				
1200-1300	1.39	250	37	
1300-1400	1.21	230	38	
1400-1500	1.07	210	37	
1500-1600	1.07	200	36	
1600-1700	0.54	140	34	
1700-1800	0.36	80	31	
1800-1900	0.31	130	27	
1900-2000	0.40	270	24	
2000-2100	0.36	120	23	
2100-2200	0.36	90	22	
2200-2300	0.22	90	21	
2300-2400	0.13	120	21	

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA[a]

Date: 7/12/83 Site: Neal's Dump

Time Period Hrs, EST	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100	0.13	140	20	
0100-0200	0.22	80	19	
0200-0300	0.22	50	19	
0300-0400	0.31	80	19	
0400-0500	0.36	150	19	
0500-0600	0.27	330	22	
0600-0700	0.76	220	26	
0700-0800	1.03	230	30	
0800-0900	0.98	230	33	
0900-1000	1.25	230	36	67
1000-1100	1.16	260	38	64
1100-1200	1.43	280	37	53
1200-1300	1.12	250	38	47
1300-1400	1.21	280	38	40
1400-1500	0.89	270	37	37
1500-1600	0.72	350	36	37
1600-1700	0.54	60	33	41
1700-1800	0.22	100	32	
1800-1900	0.31	110	29	
1900-2000	0.27	90	26	
2000-2100	0.31	70	25	
2100-2200	0.27	50	24	
2200-2300	0.27	350	24	
2300-2400	0.31	60	23	

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA[a]

Date: 7/13/83 Site: Neal's Dump

Time Period Hrs, EST	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100	0.36	70	23	
0100-0200	0.27	70	22	
0200-0300	0.31	50	21	
0300-0400	0.27	50	20	
0400-0500	0.13	330	21	
0500-0600	0.40	270	23	
0600-0700	0.40	30	27	
0700-0800				
0800-0900				
0900-1000				
1000-1100				
1100-1200				
1200-1300				
1300-1400				
1400-1500				
1500-1600				
1600-1700				
1700-1800				
1800-1900				
1900-2000				
2000-2100				
2100-2200				
2200-2300				
2300-2400				

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA[a]

Date: 7/17/83

Site: Lemon Lane Landfill

Time Period Hrs, EST	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100				
0100-0200				
0200-0300				
0300-0400				
0400-0500				
0500-0600				
0600-0700				
0700-0800				
0800-0900				
0900-1000				
1000-1100				50
1100-1200				48
1200-1300				41
1300-1400	2.15	340	34	40
1400-1500	1.30	340	31	64
1500-1600	1.16	330	31	64
1600-1700	0.40	270	31	
1700-1800	0.18	215	31	
1800-1900	0.31	200	28	
1900-2000	0.04	120	26	
2000-2100	0.36	120	25	
2100-2200	0.31	180	24	
2200-2300	0.22	210	24	
2300-2400	0.22	240	23	

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA(a)

Date: 7/18/83 Site: Lemon Lane Landfill

Time Period Hrs, EST	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100	0.40	210	23	
0100-0200	0.63	230	23	
0200-0300	0.31	230	23	
0300-0400	0.58	320	23	
0400-0500	0.31	210	24	
0500-0600	0.63	270	26	
0600-0700	0.80	250	29	
0700-0800	0.89	280	32	
0800-0900	1.56	320	33	61
0900-1000	1.65	320	35	42
1000-1100	1.61	310	36	45
1100-1200	1.34	290	38	43
1200-1300	1.21	270	38	38
1300-1400	1.34	250	38	38
1400-1500	1.56	240	38	45
1500-1600	2.24	310	33	44
1600-1700	0.54	240	31	53
1700-1800	0.54	130	31	
1800-1900	0.27	140	28	
1900-2000	0.40	130	26	
2000-2100	0	150	24	
2100-2200	0.22	170	24	
2200-2300	0.49	120	23	
2300-2400	0.31	170	23	

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA(a)

Date: 7/19/83

Site: Lemon Lane Landfill

Time Period Hrs, EST	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100	0.45	195	23	
0100-0200	0.54	230	24	
0200-0300	0.31	230	24	
0300-0400	0.27	190	23	
0400-0500	0.45	190	24	
0500-0600	0.58	230	27	
0600-0700	0.80	250	31	
0700-0800	1.56	315	33	
0800-0900	1.83	315	34	
0900-1000	1.97	315	36	
1000-1100	1.56	290	37	
1100-1200	1.56	280	38	
1200-1300	1.79	300	39	
1300-1400	1.88	310	39	
1400-1500	2.06	300	38	
1500-1600	1.79	360	36	
1600-1700	0.98	360	35	
1700-1800	0.80	30	33	
1800-1900	0.27	80	31	
1900-2000	0.31	130	28	
2000-2100	0.31	110	27	
2100-2200	0.54	110	26	
2200-2300	0.36	180	26	
2300-2400	0.09	190	26	

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA(a)

Date: 7/20/83

Site: Lemon Lane Landfill

Time Period Hrs, EST	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100	1.43	40	26	
0100-0200	1.34	30	23	
0200-0300	1.12	120	22	
0300-0400	0.31	140	22	
0400-0500	0.36	210	23	
0500-0600	0.45	360	26	
0600-0700	0.58	230	29	
0700-0800	1.12	220	33	
0800-0900	1.39	250	37	70
0900-1000	1.52	285	38	61
1000-1100	1.48	290	38	52
1100-1200	1.74	290	39	49
1200-1300	1.74	290	39	50
1300-1400	2.06	255	40	46
1400-1500	1.43	270	41	42
1500-1600	1.39	290	39	42
1600-1700	0.94	240	38	42
1700-1800	0.31	180	36	42
1800-1900	0.13	340	32	
1900-2000	0	10	29	
2000-2100	0.09	15	28	
2100-2200	0.27	240	27	
2200-2300	0.85	230	28	
2300-2400	1.07	240	28	

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA(a)

Date: 7/21/83

Site: Lemon Lane Landfill

Time Period Hrs, EST	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100	0.36	240	28	
0100-0200	0.09	310	27	
0200-0300	0.22	120	26	
0300-0400	0.31	240	25	
0400-0500	0.54	230	26	
0500-0600	0.58	250	30	70
0600-0700	0.89	290	33	
0700-0800	1.34	310	35	58
0800-0900	1.79	320	37	56
0900-1000	1.79	310	38	49
1000-1100	1.92	285	39	58
1100-1200	2.01	290	40	45
1200-1300	2.01	280	40	39
1300-1400	1.70	280	42	33
1400-1500	1.52	280	42	39
1500-1600	1.52	290	41	37
1600-1700	1.07	260	39	36
1700-1800	0.31	230	37	
1800-1900	0.04	210	32	
1900-2000	0	260	29	
2000-2100	0	300	27	
2100-2200	0	320	26	
2200-2300	0	20	25	
2300-2400	0.09	110	25	

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA[(a)]

Date: 7/22/83

Site: Lemon Lane Landfill

Time Period Hrs, EST	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100	0.22	220	24	
0100-0200	0.36	220	25	
0200-0300	0.31	220	25	
0300-0400	0.22	180	24	
0400-0500	0.45	200	26	
0500-0600	0.54	260	30	
0600-0700	0.89	250	33	
0700-0800	1.34	310	35	
0800-0900				
0900-1000				
1000-1100				
1100-1200				
1200-1300				
1300-1400				
1400-1500				
1500-1600				
1600-1700				
1700-1800				
1800-1900				
1900-2000				
2000-2100				
2100-2200				
2200-2300				
2300-2400				

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

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